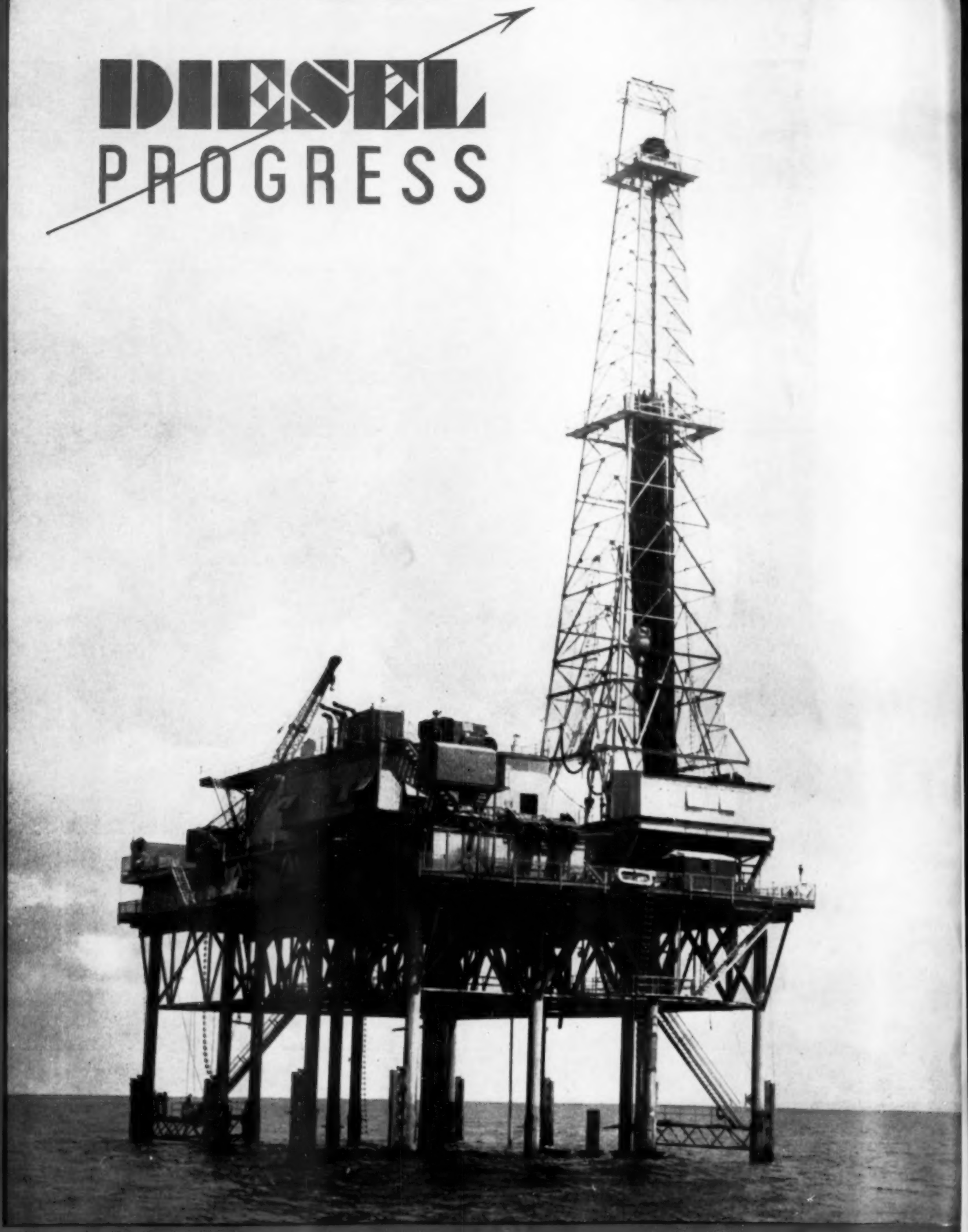
DIESEL PROGRESS

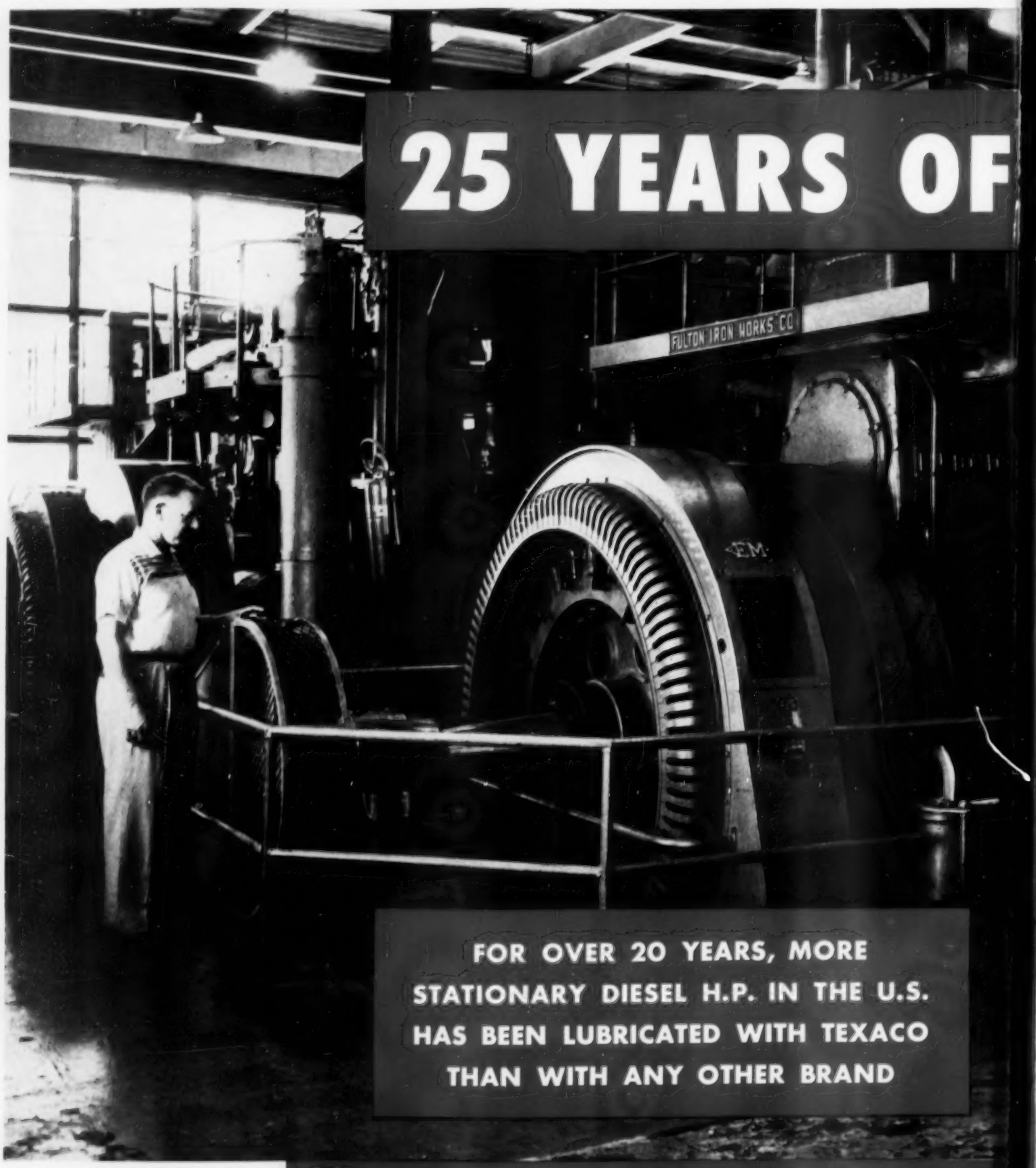
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

DECEMBER, 1955

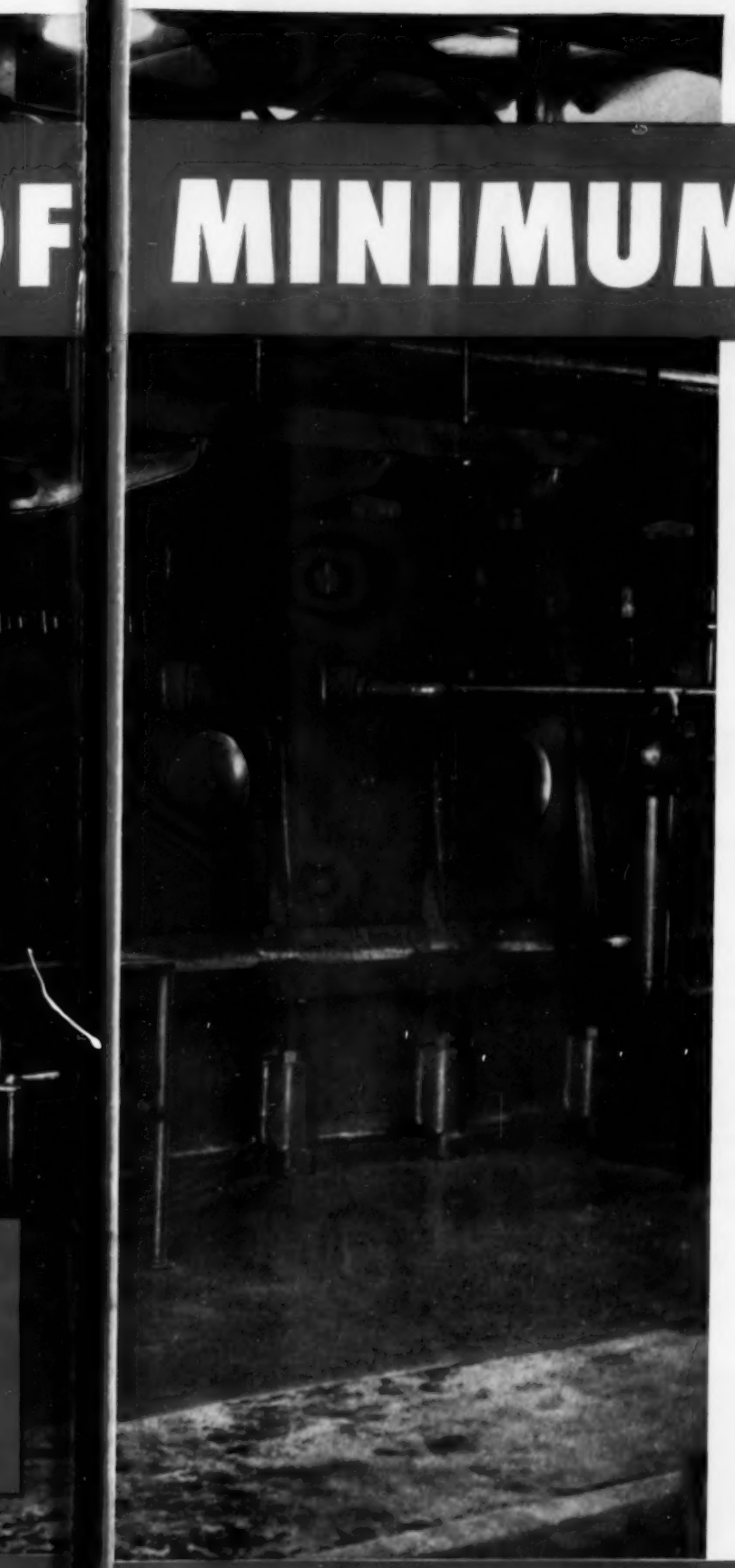
FIFTY CENTS PER COPY


25 YEARS OF
FULTON IRON WORKS CO
FOR OVER 20 YEARS, MORE
STATIONARY DIESEL H.P. IN THE U.S.
HAS BEEN LUBRICATED WITH TEXACO
THAN WITH ANY OTHER BRAND

TUNE IN:
TEXACO STAR THEATER
starring
JIMMY DURANTE
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

TEXACO



OF MINIMUM COSTS

HERE'S a report from Merle D. Geving, Superintendent of Le Sueur, Minnesota, Municipal Utilities, about his plant's 25-year experience with *Texaco Ursa Oil:*

> **"We started using *Texaco Ursa Oil* with our first diesel — installed in 1930. It gave us such fine lubrication — clean operation, no harmful deposits, no stuck rings, minimum wear — that we naturally chose *Texaco Ursa Oil* for each of the four other engines installed since.**
>
> **"Today, we operate three straight diesels and two dual-fuel engines, and *Texaco Ursa Oil* is in the crankcases and cylinders of them all. We consider this an important factor in keeping maintenance and operating costs at an absolute minimum."**

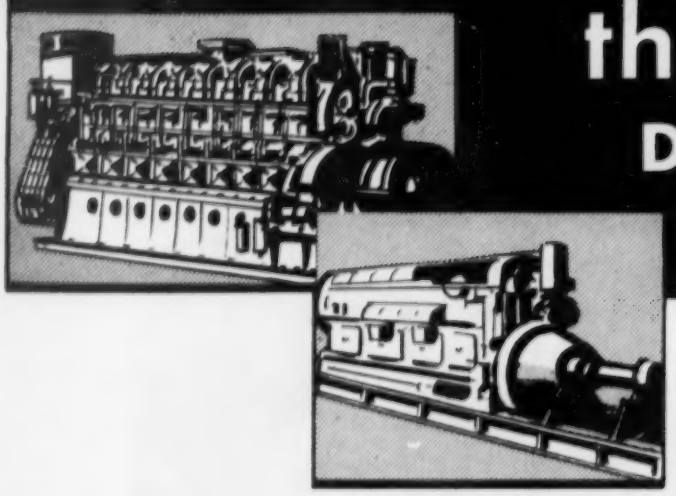
Your plant, too, can enjoy these benefits. There is a complete line of the famous *Texaco Ursa Oils* especially refined and processed to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

Let a Texaco Lubrication Engineer help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

DISCOVER the BIG DIFFERENCE



DaRoS PISTON RINGS ARE BETTER—3 WAYS!

1. DaRoS, and only DaRoS, offer rings made of world-famous Swedish Charcoal Iron — engineered and produced by "old world" craftsmen at Davy Robertsons Maskinfabrik.

2. That's why DaRoS Rings have a lower rate-of-wear than other makes. 50 to 90% lower! Wear on cylinders is less, too! That means thousands of more operating hours between ring renewals and cylinder re-conditioning! Less "down-time" for your equipment.

3. DaRoS Rings also cut fuel costs 10 to 15% because they constantly maintain complete efficiency in either worn or new cylinders — there's no leakage — no blow-by.

One installation will convince you. Write, wire or phone for recommended application and prices now.

IMMEDIATE DELIVERY FROM CHICAGO on Popular Sizes

(This is ad #8 in a series designed to tell Diesel Operators the important story about DaRoS Swedish Iron Piston Rings.)

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AMERICAN CORPORATION

D. D. Cook, President

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Distributors for North, Central and South America

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IN INDUSTRY · IN TRANSPORTATION · ON THE SEA · IN THE AIR

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FRONT COVER ILLUSTRATION

This platform-type drilling rig is making hole for the Phillips Petroleum Co. 35 miles from the Louisiana shore in the Gulf of Mexico. It is powered by a 1750-hp Electro-Motive diesel-electric system, the first of these units to go into offshore service.

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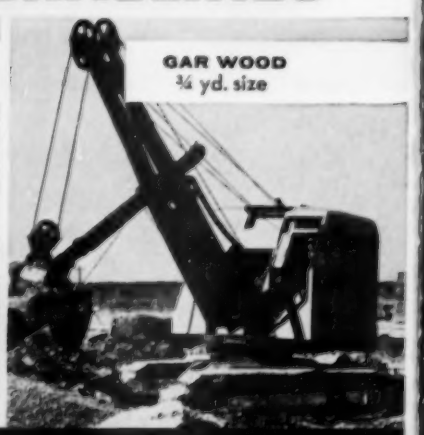
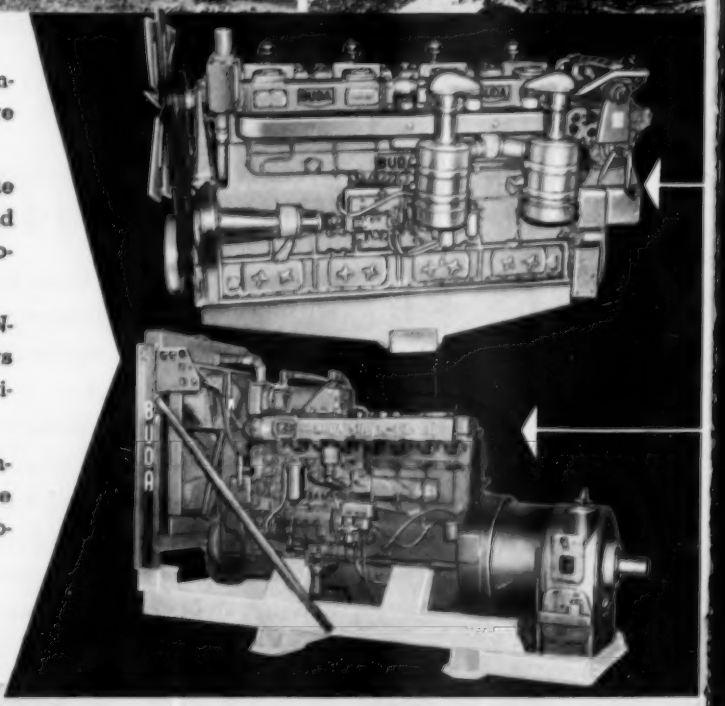
GET MORE WORK

FROM SHOVELS, CRANES, DRAGLINES





Specify or install an Allis-Chalmers Diesel or gasoline engine in any of these shovels, cranes or draglines and insure your investment in your machine.

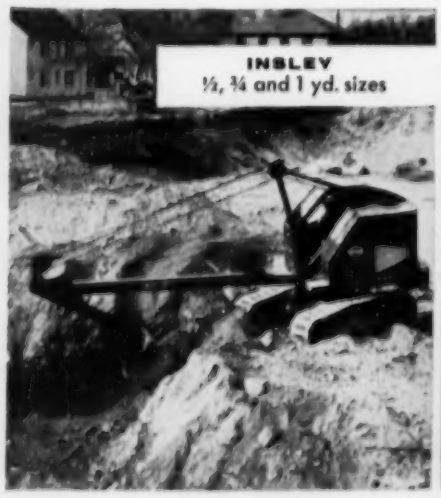
BIG, RUGGED WORKHORSE ENGINES with high torque in the normal operating range, they have the power and stamina to give you smoother, faster cycles for greater production, year in and year out, on any kind of job.

SIMPLE IN DESIGN . . . EASY TO SERVICE AND MAINTAIN—smokeless, quiet and smooth-running, Allis-Chalmers engines are packed with features that will pay you dividends in low cost, high production operation.

FOR EYE OPENING FACTS on how Allis-Chalmers engines make shovels, cranes and draglines more productive at less cost, see your nearby Buda Division Engine Distributor soon.

BUDA DIVISION · HARVEY, ILLINOIS

BC-36



...at less cost

POWERED BY ALLIS-CHALMERS ENGINES

HANSON
⅜ and ½ yd. sizes

P & H
3½ yd. size

QUICK-WAY
¼, ⅓ and ⅜ yd. sizes

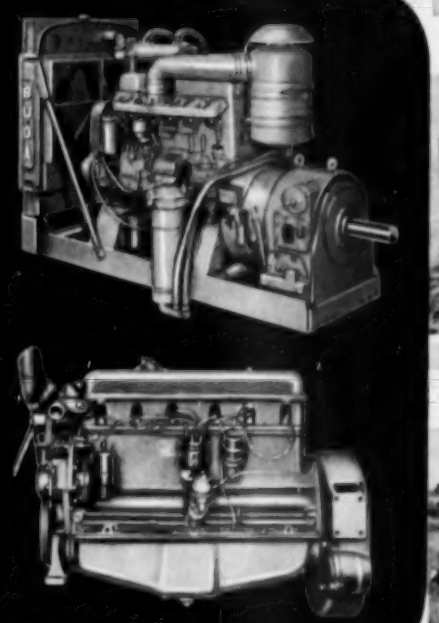
FULL RANGE OF DIESEL AND GASOLINE POWER

Diesel
Model 8DC-2505 388 h.p.

Diesel
Models 6DA-779, 6DA-844 and 6DA-970 with Torque Converter
185, 215 and 240 h.p.

Diesel
Models 8DAS-1125 and 8DAS-1290 with Torque Converter
350 and 375 h.p.

Gasoline
Models 6B-230 and 6B-273
78 and 85 h.p.



SCHIELD BANTAM
⅜ yd. size

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½ yd. size

LIMA
½, ¾, 1, 1½, 3½ yd. sizes

NORTHWEST
¾, 1 yd. sizes

MANITOWOC
2½, 3 yd. sizes

ALLIS-CHALMERS

For a Tug that's Quicker on its Tows

GREAT LAKES TOWING PICKS GM TURBOCHARGED DIESEL POWER

Within the past five years, the Great Lakes Towing Company has converted 28 tugs of their fleet from steam to GM Diesel power.

This progressive planning has paid dividends.

Now Great Lakes will repower six more steam tugs with the new GM Turbocharged 2-cycle Model 498 engines.

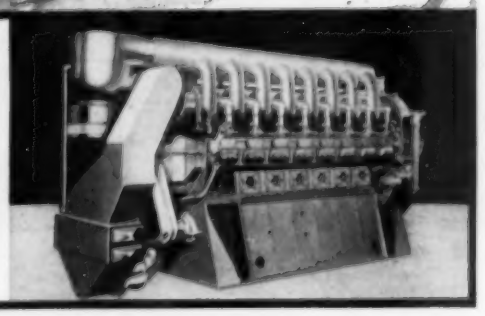
This forward planning program means that Great Lakes Towing will be capable of handling all large vessels which will come into the Lakes through the St. Lawrence Seaway.

The New Series 498

GM TURBOCHARGED DIESEL

gives you

- 75% more power per cylinder
- 60% more power per cubic foot
- 60% more power per pound
- 12% lower specific fuel consumption
- 36% minimum thermal efficiency



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Engine Division of General Motors, Cleveland 11, Ohio

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San Diego, Seacord Pump and Injector, 1337 India Street
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Wilmington, Diesel Control Corporation, 218 North Marine Ave.

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Miami 36, Florida Diesel Service Co., 1930 North Miami Ave.

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Chicago 16, Illinois Auto Electric Co., 2011-37 Indiana Avenue
Rock Island, Lohse Automotive Service, Inc., 430 17th Street

INDIANA
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IOWA
Des Moines 9, Electrical Service & Sales Co., 1313 Walnut Street

KENTUCKY
Louisville 4, Ellingsworth Auto Electric Co., 1003 East Broadway

LOUISIANA
Baton Rouge, Womack Bros. Diesel Service, 6983 Airline Highway
Bossier City, Vaughan Tractor & Auto Parts Co., 605 West Street
Mail Address: P.O. Box 661, Shreveport, La.
Morgan City, Landry's Diesel Injector Service, P. O. Box 246
New Orleans 21, Gerhardt's Fuel Injection Service, 2501 Jefferson Highway
New Orleans 13, John M. Walton, Inc., 1050 Carondelet St.

MARYLAND
Baltimore 1, Parks & Hull Automotive Corp., 1033 Cathedral St.

MASSACHUSETTS
Newton Upper Falls, W. J. Connell Co., 210 Needham Street, Newton Industrial Center

MICHIGAN
Detroit 2, Knorr-Maynard, Inc., 5743 Woodward Ave.

MINNESOTA
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Minneapolis 6, Diesel Service Co., 2509 East Lake St.
Minneapolis 2, Reinhard Bros. Co., Inc., 11 South 9th Street

MISSISSIPPI
Jackson, Womack Bros. Diesel Service, 1321 S. Gallatin Street

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Kansas City 8, Electrical & Magneto Service, Inc., 2538 Grand Avenue
St. Louis 23, Diesel Fuel Injection Service Co., 9331 South Broadway

NEBRASKA
Omaha 2, Carl A. Anderson, Inc., 16th & Jones St.

NEW JERSEY
Newark 2, Tire Trading Co., 239 Halsey Street

NEW YORK
Brooklyn 32, A & D Diesel Service, Inc., 145 21st Street
Brooklyn 38, E. A. Wildermuth, Inc., 1102 Atlantic Avenue
Buffalo 9, Hettrich Electric Service, 1032 Ellicott St.
Troy, Ehrlich Electric Service, Inc., 200 Fourth St.
Uniondale, A & D Diesel Service of Hempstead, 811 Nassau Road

NORTH CAROLINA
Raleigh, Diesel Injection Sales & Service, Inc., 3015 Hillsboro Street
Raleigh, Diesel Injection Service, 200 Fourth Ave.

OHIO
Cleveland 14, Cleveland Ignition Co., 1301 Superior Ave., N.E.

OKLAHOMA
Tulsa 3, Magneto Ignition Co., 701 West Fifth St.

OREGON
Portland 14, Automotive Products, Inc., 1700 Southeast Grand Avenue

PENNSYLVANIA
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Hazleton, Penn Diesel Service Co., No. Church at 27th St.
Philadelphia 32, J. W. Parkin, Jr., 2251 N. Broad Street
Pittsburgh 6, Automotive Ignition, 6358 Penn Avenue

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Memphis 4, Automotive Electric Service Co., 982 Linden Avenue

TEXAS
Corpus Christi, Womack Bros., 2002 Leopard St.
Dallas, Beard & Stone Electric Company, 3909 Live Oak St.
El Paso, Reynolds Battery & Magneto, 801 Myrtle Avenue
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Houston 11, Magneto & Diesel Injector Service, 6931 Navigation Blvd.
Odessa, Electric Service & Supply, 1601 N. Grant St.
San Antonio 3, Womack Bros., 123 West Carolina

UTAH
Salt Lake City 2, Diesel Electric Service & Supply Co., 60 East 13th St., South

VIRGINIA
Norfolk, Diesel Injection Sales & Service, 808 Union Street
Richmond 20, Charles H. Woodward Electric Company, 709 West Broad St.
Salem, Diesel Injection Sales & Service, 814 8th Street

WASHINGTON
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Spokane 2, Sunset Electric Co., North 703 Division St.

WISCONSIN
Milwaukee 2, Wisconsin Magneto Co., 918 North Broadway

Canada

ALBERTA
Calgary, Hutton's Ltd., 131—11th Ave., West

BRITISH COLUMBIA
Vancouver, Fred Holmes Fuel Injector Sales & Service, Ltd., 627 Bidwell Street
Vancouver 4, Magneto Sales & Service, Ltd., 126 Gore Ave.

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Fredericton, Stairs Brothers, 493 Northumberland Street

NEWFOUNDLAND
St. John's, A. H. Murray & Co., Ltd.

QUEBEC
Montreal, International Electric Co., 1037 Bleury St.

ONTARIO
Toronto, Diesel Equipment Ltd., 139 Laird Drive, Leaside

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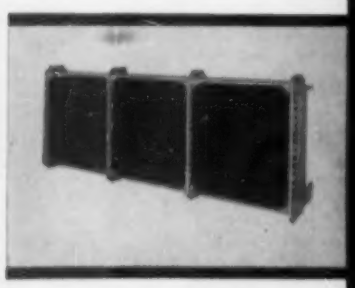
Bendix International Division
205 East 42nd Street, New York 17, N. Y.

SCINTILLA DIVISION

Bendix AVIATION CORPORATION

COOLED RIGHT FOR THE EAGLE'S FLIGHT!



Harrison holds the heat down for Missouri Pacific's famous Eagle!

Throttle's wide open . . . for wide open spaces! The Mo-Pac's famous Eagles streak over 10,000 cross-continental miles—through mountain passes and burning deserts—serving the great West-Southwest. On board are Harrison heavy-duty lube oil and jacket water coolers . . . keeping temperatures down and engines cool! Harrison coolers are rugged, reliable and compact . . . ready for duty on the most modern Diesel engines. You'll find Harrison heat exchangers on the majority of up-to-date locomotives today . . . providing efficient cooling for peak performance. If you have a cooling problem, look to Harrison for the answer.

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

GM GENERAL MOTORS

HARRISON

TEMPERATURES MADE TO ORDER

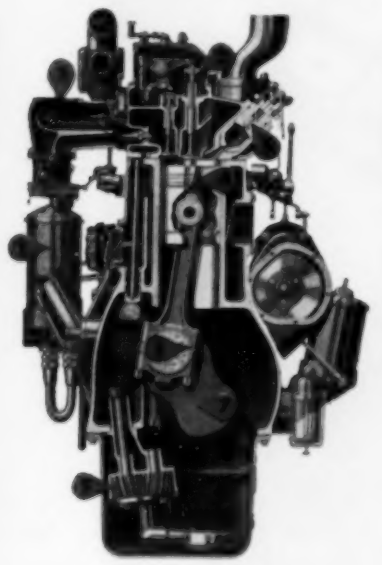
1 FULL FLOW OIL FILTER—Before oil goes under pressure to engine bearings, all harmful particles are removed by replaceable plastic-impregnated, full-flow filters.

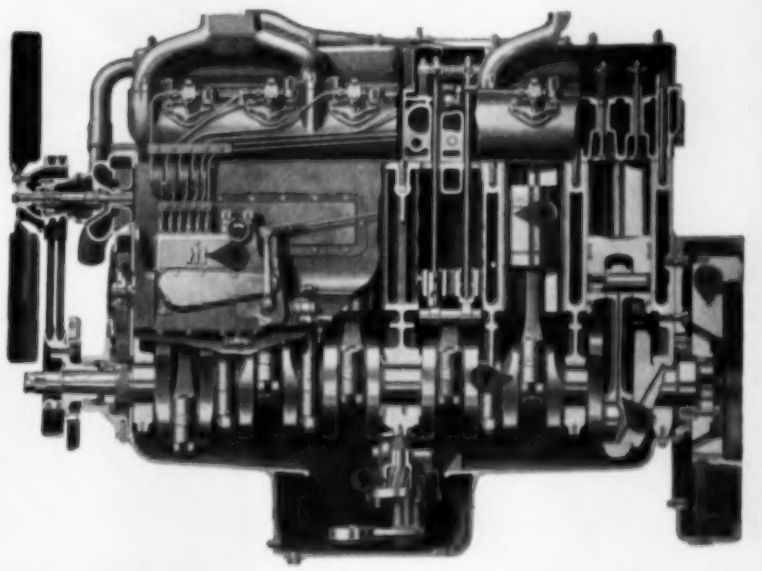
2 POSITIVE ROTATORS EXTEND VALVE LIFE. Exhaust valve rotators keep valves turning, at all engine speeds, distributing heat uniformly around the valves to keep deposits from building up on stems and seats, and also to prevent sticking, scuffing, and burning.

3 POSITIVE ALL-WEATHER STARTING. Seconds-fast, International Diesels start in coldest weather on exclusive gasoline starting system. Cylinders are pre-heat conditioned to give complete, clean combustion, instantly, on switching to operation on Diesel fuel.

4 ALUMINUM-ALLOY PISTONS have a thick crown at the top for rapid dissipation of excess heat direct to the cooling water. Hardened, replaceable, cylinder sleeves, three compression rings, with top ring chrome-plated, plus two oil control rings assure long-lasting, gas-tight seal for high compression ratios of over 15 to 1 . . . providing top fuel and oil economy.

5 SIMPLE, SINGLE-HOLE, INJECTION NOZZLE and pre-combustion chamber set at 45° angle for smooth, clean combustion of low grade No. 2 fuel oil under all engine speed and load conditions.





6 NEW IH INJECTION PUMP: Single plunger type on four-cylinder models, twin-plungers on six-cylinders . . . provide all cylinders equal amounts of fuel, precisely metered to load, whether for idling, maximum horsepower, or maximum torque under overload. New, harder injection plungers have up to four times longer life.

7 HEAVY-DUTY FORGED CRANKSHAFT with large diameter, induction-hardened journals provides long-lasting, wear-resistant bearing surfaces . . . rifle-drilled for full pressure lubrication . . . dynamically balanced for smooth operation.

8 REPLACEABLE TRI-METAL BEARINGS provide precision clearance for full-pressure lubrication and thousands of hours of heavy-duty work. Smooth electroplating of white alloy metal over copper-lead, precision bonded to a steel back, carries heavy loads with minimum friction.

9 FULL-PRESSURE LUBRICATION for long life. Big, gear-type pump delivers oil under controlled pressure through full-flow filters and rifle-drilled passages to main and connecting rod bearings, piston pins, camshaft, timing gears, and valve rocker arms.

10 HEAVY FLYWHEEL helps to maintain uniform speed under widely varying load conditions. Available to match standard makes of clutches, fluid couplings, and torque converters.

Hour after hour..year after year

INTERNATIONAL ENGINES

. . . stay on the job with least upkeep

All International engines are built throughout to give you a full measure of power that stands up and stays on the job. They are precision-manufactured of thoroughly tested materials under continuous, quality-control inspection. Pressure lubrication through rifle-drilled crankshafts and internal passages assures trouble free performance. Inbuilt precision is fully protected from dirt and grit under the worst of job operating conditions by the best of fuel, oil, and air filters.

Heavy-duty radiators, power take-offs, and other factory-engineered power unit components are available to fit these long-life, money-saving engines to your job requirements. You can also get them as original equipment in most makes of construction machines. Call your nearest International Industrial Power Distributor or Power Unit Dealer for all the facts.

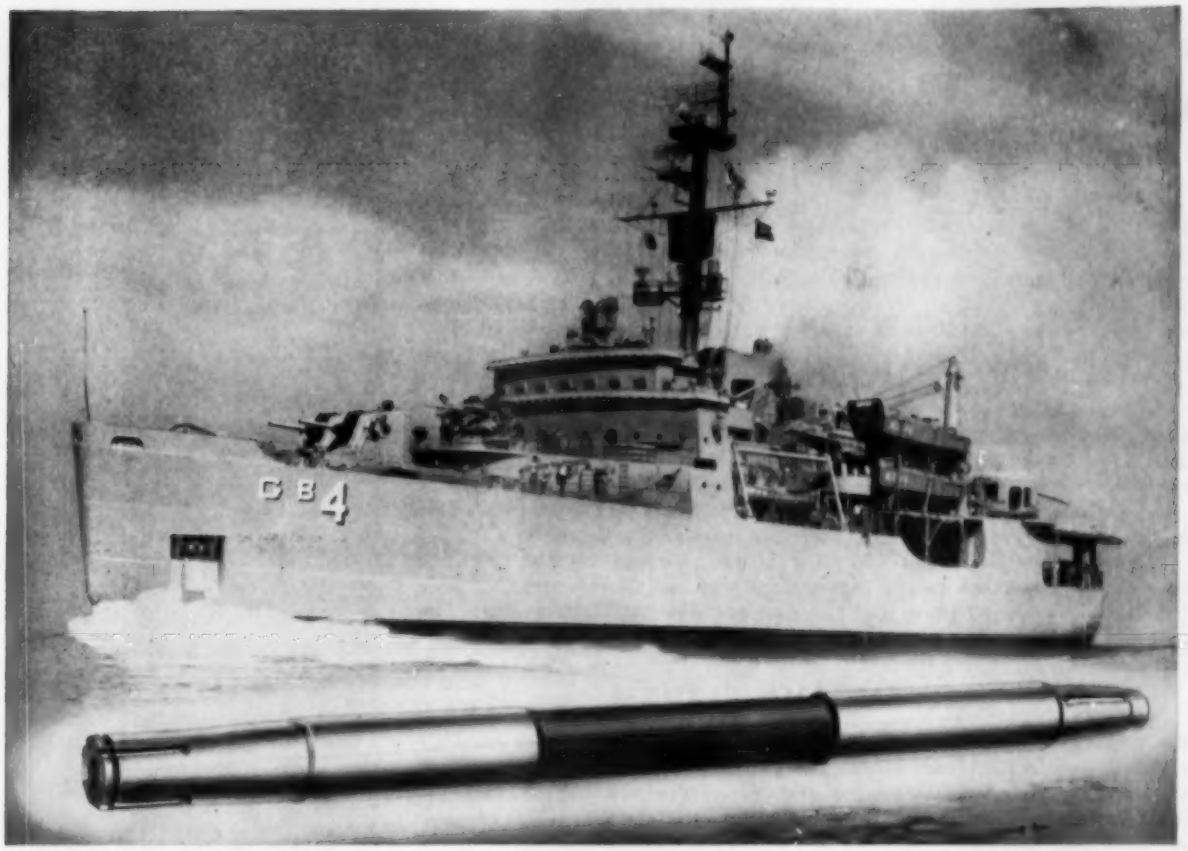
There's a size and type of International engine to fit your needs . . . from 16½ to over 200 hp.

INTERNATIONAL HARVESTER

INTERNATIONAL
INDUSTRIAL POWER

MAKES EVERY LOAD A PAYLOAD

SCHWITZER CORPORATION
INDIANAPOLIS, INDIANA
for 37 years
FANS
PUMPS
SUPERCHARGERS
TURBOCHARGERS
DAMPERS
SEALS
SCHWITZER CORPORATION



OFFICIAL UNITED STATES NAVY PHOTOGRAPH
COURTESY OF THE INGALLS SHIPBUILDING CORPORATION

HORSEPOWER GOES TO SEA —

Another Erie Shaft Drives this Navy Ice Breaker

We use the word "another" because we have produced literally thousands of forged steel components for Diesel and Marine use. From raw material to finished product, under one control and with a single responsibility, forged steel cranks, drive shafts, connecting rods, special forgings for processing equipment and a diversity of steel castings for heavy industry are our daily accomplishment. Isn't it quite logical, then, to place your forged and cast steel components requirements with us? We shall welcome opportunities to consult with you.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA

WOODWARD

GOVERNOR SERVICE

SUITS ALL FIELD CONDITIONS

We at the Woodward Governor Company have always been ready, willing and able to give users of our equipment competent, economical and, whenever necessary, very fast service, for routine governor overhauls or for emergencies that arise on rare occasions. When speed is important we have a fleet of airplanes and several competent pilots to transport governors or service men quickly.

BUT—a lot of users of our equipment don't seem to know about this. Here's the story:

Our experienced people, using the best and most expensive special tools, test stands, and other facilities in our plant can rebuild a governor in a minimum time. They install all the latest improvements, so the rebuilt governor often works better or lasts longer in service than when it was new.

In most real, but fortunately rare, emergencies, we can do the job in one day, though ordinary jobs require more time because our shop is very busy.

The cost, labor plus regular list price for parts, depends on how clean the governor has been kept, its age, engine roughness, and other factors.

Here are four ways to have your governor put in new condition, with a new governor guarantee on work done in our plant:

1. REPAIR AND RETURN

While your engine or turbine is shut down for other work, return the governor to our factory in Rockford, Illinois. No return tags needed, no formalities—just make sure your company name is on the crate. It helps too, if your purchase order lists the governor serial number. Some governors of which only one or a few were built can only be handled this way. In most cases the unit exchange plan below is better and the cost is the same.

2. UNIT EXCHANGE

Send us a purchase order with the serial number of your governor, and tell us when you plan to shut down to install it. We'll ship a governor like yours but with all the latest improvements. It takes only a few minutes to remove the old one and install the replacement. Send the old governor back to us for overhaul, and we'll keep it in our stock ready for the next plant that needs it. Try to order early when possible, and we'll try always to give same day service IF there's a real emergency. The cost? Same time and material as above. You pay shipping costs.

3. OVERHAUL OR REPAIR IN YOUR PLANT

This is the most expensive and least satisfactory way to overhaul a governor, but if an emergency or special circumstances make it desirable, we'll send a man to your plant.

4. DO IT YOURSELF

Some competent mechanics repair their own governors in the field, though there usually isn't much saving in doing so. Give us the serial number of the governor and we'll send bulletins and suggest parts you may need. If you have a lot of governors, send your repair man to our plant for two to four days training. If you're having some little trouble, write us about it and maybe we can tell you the cause. HALF THE GOVERNOR TROUBLES AREN'T IN THE GOVERNOR—AND MOST OF THE OTHERS COME FROM DIRT. Washing the governor in spirits once a year and filling with clean oil helps prevent trouble. You can easily replace your own oil seals every few years.

CAN WE HELP?
WANT INSTRUCTION BULLETINS?

Tell us the serial number of the governor (or typical governors) and what it's controlling (AC generating unit, boiler feed water pump turbine, cat-cracker air blower, etc.). We'll answer promptly.

WOODWARD GOVERNOR COMPANY
Rockford, Illinois

WOODWARD SERVICE

WORLD'S OLDEST AND LARGEST MANUFACTURER OF HYDRAULIC GOVERNORS FOR PRIME MOVERS

MORE PULL WITH LESS FUEL!

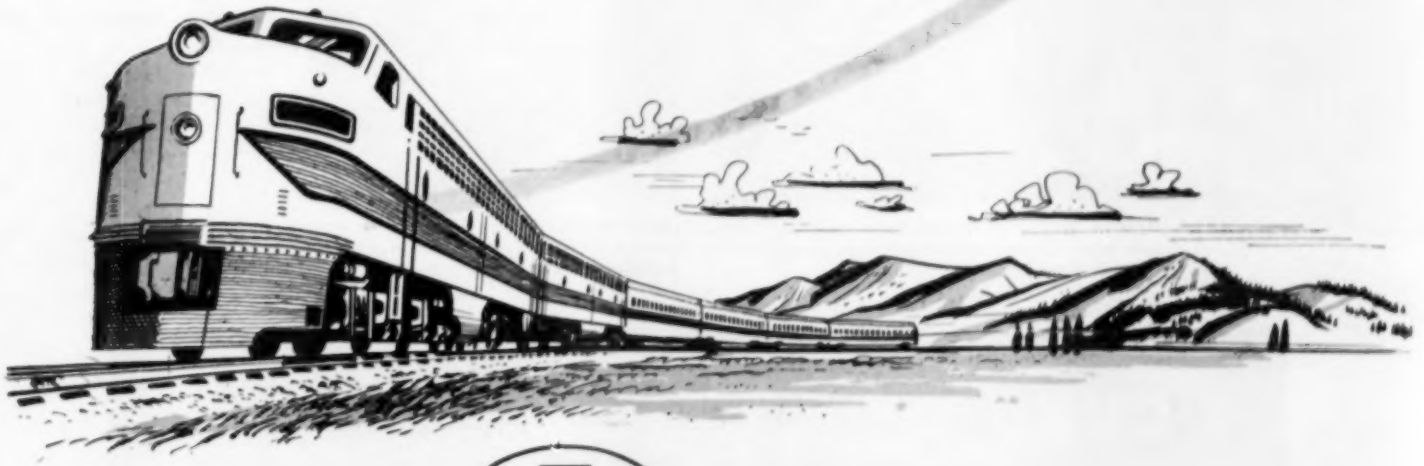
AiResearch Turbochargers provide rapid response to acceleration demands... end objectionable smoking!

Consider what the application of AiResearch Turbochargers to diesel locomotives will accomplish: A team of these small power packages will provide a greater increase in power at smaller cost in space and weight than any comparable turbocharger or supercharger installation.

In addition, specific fuel consumption on a horsepower per hour basis will be far less. Sea level performance will be restored within operating limits at altitude, response to acceleration demands will be rapid and excessive smoking under operating power eliminated. Also, the noise level will be greatly reduced.

Application in other fields will be equally effective, as has already been demonstrated in the remarkable results achieved by the installation of AiResearch Turbochargers on Caterpillar diesel machinery.

AiResearch is the largest producer of small turbomachinery in the United States, with twenty-five *million* hours of experience. This unmatched experience explains why AiResearch Turbochargers lead in power, economy and dependability.
Your inquiries are invited.



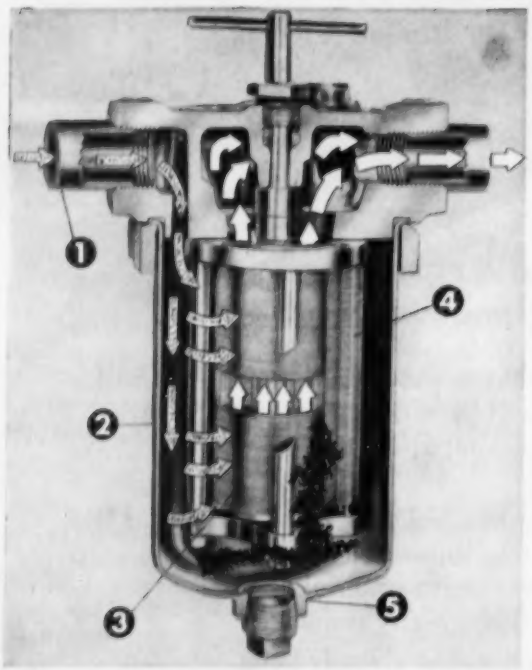
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

New CUNO SUPER Auto-Klean Filter can boost engine life up to 50%



HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter. (3) Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Here's what the U.S. Army has done to test Cuno's new 40-micron SUPER Auto-Klean filter for their engines:

They ran destruction tests on several identical engines equipped with different brands of filters. As they ran, dust was introduced into the air intakes. When compression fell to half its initial value, the test was stopped. Best life for engines equipped with cartridge-type filters was 60 hours.

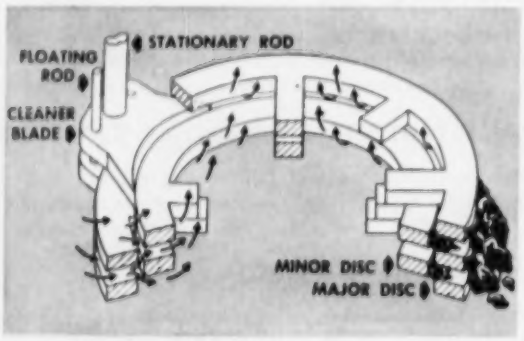
The engine with SUPER Auto-Klean ran 90 hours—30% longer—and *compression was still above half its initial value!*

You can get SUPER Auto-Klean now!

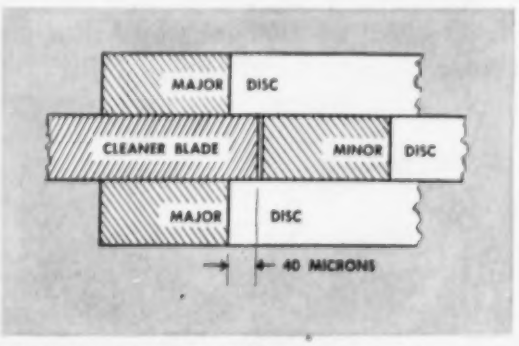
Just specify that the manufacturer equip your new diesel with this latest and best in filtration—both for fuel and full-flow lube. You'll get longer engine life and . . .

1. **Full-Flow** 40-micron filtration with a self-cleaning filter. No cartridge changes; filter can't rupture or channel.
2. **Low pressure drop.** An 8- by 2¼-inch filter element handles 30 gpm of 200 SSU lube oil with only 3 psi pressure drop. You get high capacity in a small package.
3. **All metal.** Can't absorb or adsorb additives from oil.
4. **No interruptions for cleaning.** Handles full flow all the time.
5. **Standard Auto-Klean housing.** On existing engines you can easily replace most 2¼ in. diameter cartridges with SUPER Auto-Klean or simply install SUPER Auto-Klean in the full-flow lube line following the discharge of the engine pump.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing diesel. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 10-12 South Vine Street, Meriden, Connecticut. 8.5



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against precision ground minor disc. Oil flow is shown by arrows.



LARGE PARTICLES (over 0.012 in.) are stopped at space between major discs. Short 40-micron restriction stops 40-micron particles, but allows high flow rate.

CUNO **ENGINEERED FILTRATION**

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

Cost-Saving Handling Techniques

Studies of handling techniques in ten industries, illustrations of unusual uses of fork trucks and descriptions of new equipment, are contained in the latest issue of "Material Handling News," published by the Industrial Truck Division of Clark Equipment Company. More than 50 photographs illustrate case histories of cost-saving methods.

New equipment treated includes a description of Clark's new Mobilvan system, specifications of a new line of battery-powered high-stacking Powerworker hand trucks and a 90-degree rotating clamp for handling rolls up to 60 inches in diameter.

Free copies of the two-color, 24-page magazine may be obtained by writing, Editor, Material Handling News, Clark Equipment Company, Battle Creek, Michigan.

Canadian Diesel Sales Reported

Recent sales of Cummins diesels by Russel-Hipwell Engines, Ltd., Owen Sounds, Ont., Canada, included: A 105-hp Model HRCM-400 for installation in a 40-ft. workboat belonging to Ontario-Minnesota Pump & Paper Co., Ltd., Kenora, Ont.; a 300-hp Model NHRMS-600 which the Marine Division of the Royal Canadian Mounted Police at Halifax, N.S., installed in their M/V *Burin;* a 165-hp Model HRMR-603 to Augot Fisheries Ltd., St. John's, Newfoundland for the M/V *W. E. Knock;* a 150-hp Model JMS-600 to power the workboat *Ungava Queen,* owned by Ross Tons, Moosonee, Ont.; and two 150-hp Model JMS-600s to power two Ontario Northland Railway boats.

Turbocharged Veteran Tug

A newly supercharged 19-year-old diesel which has been powering the Los Angeles harbor tug, *Crowley* #10 is now turning in a performance that is proving highly satisfactory to the owners. The craft, powered in 1936 with a 12½-in. by 17-in. Model S6 Union diesel rated at 350 hp at 280 rpm, had become a marginal vessel because of changing times and conditions. Having been a successful performer in the past, the owners was interested in increasing its rated output.

The Union Diesel Engine Company was authorized to proceed with the supercharging of the craft after having helped the operators of San Pedro Tug Boat Company thoroughly go over the engine at the time of overhaul. Union Diesel's design engineer, George Lye Mye, was assigned to the project. He successfully provided for an arrangement which fitted in with the space limitations of the existing engine room and with no fundamental changes required in the original engine. A Brown-Boveri VTR-250 exhaust gas turbocharger was used. The company's Southern California service engineer, T. K. (Kris) Vestergaard, supervised the reconditioning work as well as the installation of the turbocharging equipment. He ran the preliminary trials with the assistance of San Pedro Tug Boat Company personnel under the direction of Captain Wm. McGillivray. The official trials conducted under the direction of S. W. Newell, Union Diesel vice president, from the factory in Oakland, were impressive.

The *Crowley* #10 developed 632 bhp at 290 rpm with the vessel pushing against an immovable object. A pull of 16,000 pounds was developed after supercharging as compared to 12,500 pounds when naturally aspirated. At 315 rpm, the engine developed very satisfactorily what was estimated to be 142.4% of rated power. Exhaust temperatures remained below 700°F at all times and the exhaust was clear.

"Saves thousands of dollars and tons of weight"

Professional problem for Budd Company engineers designing the Budd RDC rail car was getting smooth, shock-free power transmission in a Diesel-driven unit that would increase railroad passenger traffic and revenue.

Low-cost solution was lightweight Allison TORQMATIC DRIVES.

The Budd Company reports, "That engineering decision saved us several thousands of dollars and 7,000 pounds per rail car." The TORQMATIC Converter-Transmission teams have proved their reliability in millions of miles of service.

The Boston and Maine Railroad — who will soon have 64 RDC's in its fleet — expects from experience to save $1,700,000 per year with the new units.

Passengers flocking to ride Budd RDC rail cars on 21 different railroads are pleasantly conscious of the infinitely smooth starts, silken acceleration, and up to 90 m.p.h. top speeds that give them faster, more comfortable commuting.

While railroad executives beam when they see their savings—two roads report Budd RDC's cut their out-of-pocket operating costs in half compared to the equipment the rail cars replaced.

If you'd build or buy better equipment, investigate Allison TORQMATIC DRIVES. You'll cut costs all along the drive line—get smooth shock-free power transmission in compact units proved on thousands of tough jobs.

You can get Allison TORQMATIC Converters for gasoline or Diesel engines from 40 to 400 horsepower—TORQMATIC Transmissions to handle up to 300 h.p. Ask your equipment dealer or manufacturer about Allison TORQMATIC DRIVES next time you buy or write direct for more information.

Allison Division of General Motors,
Box 894D, Indianapolis 6, Indiana

GM TORQMATIC

Allison
TORQMATIC DRIVES

The Engineer's Field Report

CASE HISTORY
RPM Delo Oils
LUBRICANT
Illinois-Calif. Express Co.,
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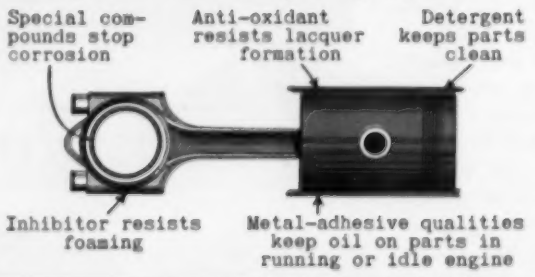
Long-haul diesel runs 217,674 extra-tough miles with only 0.003″ liner wear

THIS DIESEL piled up 217,674 tough miles in fast freight hauling through hot desert temperatures and mountain freezes. A cracked block sent tractor in for its first overhaul. When engine block cracked in Prescott, Arizona, rig made remaining 517 miles into Los Angeles with water leaking into crankcase. Despite water in oil for this distance and wide range of operating temperatures in regular service, liner wear was only 0.003", all pistons, rings (above) were clean and free of deposits. Even the bearings were still intact. Illinois-California Express Co. uses RPM DELO Lubricating Oils in this and all their fleet of diesel trucks.

RPM DELO LUBRICATING OILS

FOR MORE INFORMATION about this or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

Why RPM DELO Oils prolong engine life


Special compounds stop corrosion
Anti-oxidant resists lacquer formation
Detergent keeps parts clean
Inhibitor resists foaming
Metal-adhesive qualities keep oil on parts in running or idle engine

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DIESELS FEED ORE TO KAISER STEEL MILL

By JAMES JOSEPH

DIESEL engines are found performing hard work under hard-going every step of the way in the famed integrated West Coast steel operation of the Henry J. Kaiser empire. Diesels drive the drills, shovels and tractors that root out the iron ore in the torrid heat of the Colorado desert at Kaiser's Eagle Mountain mine. Dieselized trucks haul the ore from the open pit to the benefication plant. Diesel locomotives move the ore trains to the Fontana, Calif., mill of Kaiser Steel Corp. Diesel switchers shunt cars loaded with raw materials and finished products about the plant at Fontana. And highway trucks with diesel engines frequently pickup and deliver finished steel.

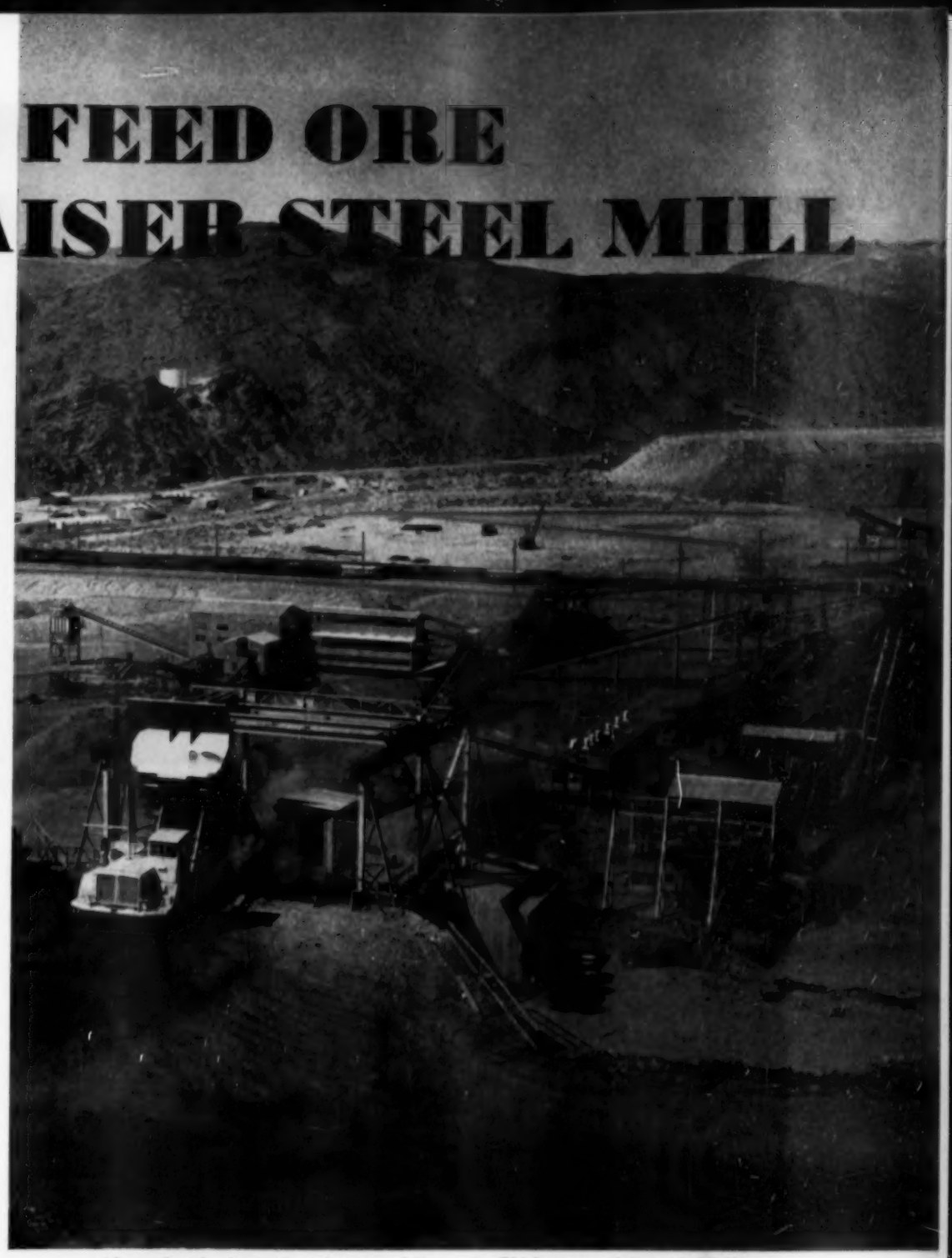
Twenty off-highway diesel rear-dumps move 8000 tons of iron ore daily at the Eagle Mountain mine. Three of these are new Kenworth 803s—said by the manufacturer to be the largest 2-axle dump trucks currently operative. Eagle Mountain, bordering Joshua Tree National Monument, is in the heart of the Colorado desert and is the sole source of the iron ore for Kaiser's Fontana mill.

The open pit has 30-ft. benches. Primary drilling rigs on the benches include both rotary and churn types. A rotary sinks its 9⅞-in. bit to an average of 35 ft., drilling a typical 18x21-ft. grid pattern. Two diesel churn drills do impact boring of blast holes with 9-in. bits. For secondary drilling, particularly for breaking up large chunks dislodged into the hole by primary blasting, there are two Gardner-Denver compressors, powered by Cat D-13000s, and several No. 600 Ingersoll-Rand units.

The rear-dumps range in capacity from the 22-ton Euclids to the giant 40-ton Kenworths. These trucks are loaded by two Model 150B Bucyrus-Erie shovels with 5-yd. dippers and a Model 120B 4½-yd. shovel —electrically driven—and one Model 54B Bucyrus-Erie diesel shovel of 4½-yd. capacity.

For the haul from Eagle Mountain's sprawling, multi-million dollar benefication plant (completed in late spring 1954), Kaiser tracks four Baldwin-Lima-Hamilton AS 6-6-1600, 150-ton, 1600-hp locomotives. These haul once-a-day ore trains, averaging 120 cars each, 52 miles to a juncture with Southern Pacific's main line at Ferrum. From Ferrum, Southern Pacific hauls another 112 miles to Fontana and the blast furnaces.

But at Eagle Mountain, the big job for diesel engines is really a short one: shuttling ore between shovels and the benefication plant's 66x84-in. primary jaw crusher which crushes the average 50% Fe ore to a maximum 8-in. diameter. It's over this shuttle course that Kaiser is currently job-testing the newest of its rigs—the three Kenworth 803s. In many respects it is a unique and trying application. The distance is short—little more than an eighth of a mile. Yet summertime temperatures climb to 120°—even higher. And the ore's inherent abrasiveness tests both men and machines. Despite the short haul, there's another factor making this job-test significant: grades. The empty uphill run averages 8% although it varies, depending on which bench the shovels are working. There's a lesser 4% uphill grade, this to a waste disposal area. It's the only considerable grade which loaded trucks must negotiate. The big problem involves heavily-loaded rigs working downgrade.

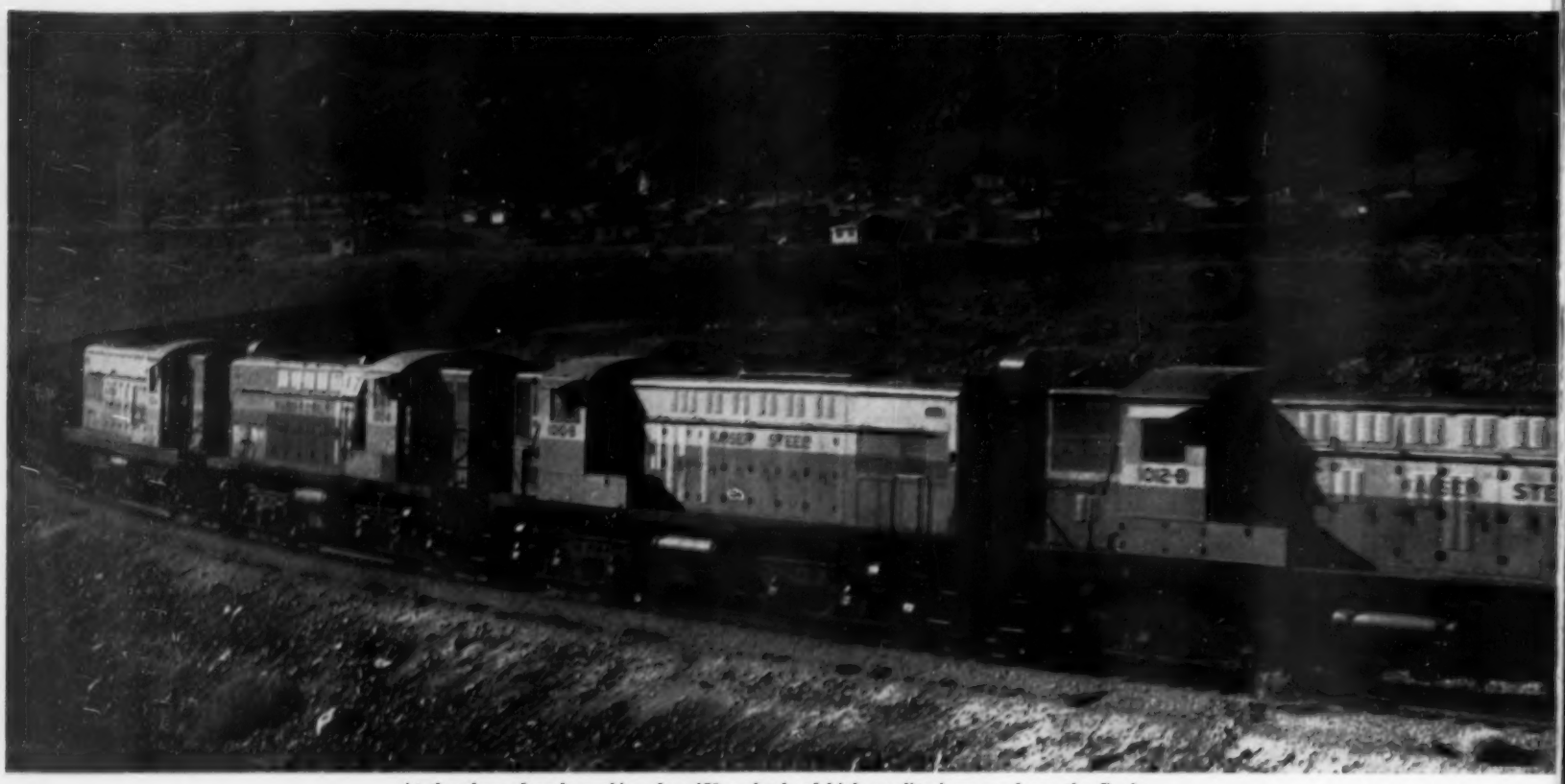


After a short haul, new Cummins-powered Kenworth off-highway rear-dumps, Model 803, unload 40 tons of ore into the primary crusher. In background is Kaiser Steel's benefication plant and its dieselized railroad which takes ore trains to the Southern Pacific tracks.

At Eagle Mountain things seem to be moving toward bigness: bigger shovels (the No. 150s) and bigger rigs (the K-803s). "With larger shovel capacity, we're testing larger-capacity trucks," explains Kaiser's general pit foreman, Wendell A. Horton. Bigness has teamed up along the open-cut's 30-ft. benches. A typical "team" consists of two, sometimes four, dump trucks working either with a No. 150-B or a No. 120-B, with "sweep-up" rigs—a Cat D-8 or a LeTourneau Tournadozer—cleaning away spillage from the shovels. The D-8 handles the heavy stuff, the Tournadozer, the light.

The Kenworth 803s are of special interest because these, the first three off Kenworth's production lines, have almost twice the capacity of other off-road diesel rear-dumps working Eagle Mountain.

Kaiser's aim is not for speed essentially but primarily for efficient truck operation—and maximum



At the close of each working day, 120 carloads of high quality iron ore leave the Eagle Mountain mine, pulled by four Baldwin diesel-electric locomotives. Each locomotive is rated 1600 hp. Travelling 52 miles over Kaiser's private rails, the ore cars then are hauled by the SP from Ferrum to Fontana, Calif.

equipment life. Engines in all rigs are governed, the go-and-return cycle between shovel and crusher held the same for all. Thus, round-trip time is identical, although the Euclids and Macks (Kaiser runs three 22½-ton Macks in its open cut) are a bit faster, 18 mph compared to the Kenworth's 12 mph when running empty, uphill.

"The important thing," says a Kaiser superintendent, "is that bigger shovels more efficiently service bigger dump bodies." With a body capacity of 24 cu. yds., a heaped capacity of 28 cu. yds., the Kenworths can take five bucketfuls from the 5-yd. shovels compared to three buckets for the 22-ton rigs. This means less swing time, changing from one truck to another. Just as important, spillage is reduced, making less work and fewer clean-up minutes for the Tournadozer and D-8 sweepers.

"Also," says an Eagle Mountain foreman, "it's surprising how fast these bigger rigs can be spotted. Faster in fact, than rigs with much less capacity." This is important in the open-cut's team set-up. Of course, these off-the-cuff findings are strictly unofficial. The K-803s haven't been on the job long enough to draw any hard and fast conclusions.

Statistically, the K-803s shape up like this: they're probably the largest two-axle off-road dump rigs at work in the U.S. Their Cummins NRT-600 en-

This Gardner-Denver compressor, powered by a D13000 Caterpillar diesel, is used for "secondary drilling"—to reduce the size of ore-bearing rock loosened by primary blasting.

Little time is lost in loading the new, huge Kenworth dump truck when 5-yd. shovels are assigned to the job. Five buckets fill the body to its heaped capacity of 28 cu. yds.

The first of three 803 Kenworths off the production line are being job tested at the Eagle Mountain mine. They are powered by turbocharged, 300-hp Model NRT-6 Cummins diesels.

gines are turbocharged and deliver 300 hp operating through Allison Torqmatic drives. These incorporate Allison's TC-654 torque converter, TG-607 Torqmatic transmission and in-the-drive-line Torqmatic brakes, the latter supplying continuous braking power where it's most needed—on downhill hauls. Although these Kenworths are powered by NRT-600s, some pilot K-803s are being equipped with Cummins' 300-hp NHRS-600 and the 400-hp NVHBI-1200 engines.The 12-cylinder engines currently are being used by Mack, Euclid and Dart. There's even speculation that some future K-803s will use the Cummins VT-12-BI, rated 600 hp if heavy enough transmissions are built. It is understood that the Model 803 was engineered to use V engines. The new Kenworths have a gross weight rating of 150,000 lbs., measure 12 ft. across front hubs, stand 14 ft. off the ground over their one-man-cab shields. Kenworth claims a 31¼-ft. turning radius for this two-axle, single-axle drive dump truck, a turning angle of 30 degrees. Front axle capacity is 50,000 lbs. The front axle alone weighs over 5000 lbs. The 100,000-lb-capacity rear axle (full floating, double reduction) is designed for 8-in. bore bearings. First reduction is a spiral bevel drive unit: final reduction, via planetary gears to each wheel. Tires (six of them) are 18:00x33, each some 6-ft. in diameter. In addition to its torque converter transmission, the K-803 is installed with power steering, featuring a full-circle steering arm with two hydraulic cylinders, the main unit exerting a force of 15,000 lbs.

The Torqmatic is new to the Kaiser operation but Eagle Mountain rigs have been equipped for the past seven years with Parkersburg Hydrotarders—with proven and highly satisfactory results. (The Hydrotarder absorbs energy developed as a load descends a grade, acts as a speed governor, dissipates braking-system heat.) Like other Kaiser ore trucks, the Kenworth 803s will be fitted into the standard maintenance schedule. Each will get a complete engine overhaul once yearly, will leave the open-cut only over weekends. (The mine works a five-day week.) Then, like sister rigs, they'll be driven down to Eagle Mountain's shops.

Kaiser uses a special lube truck which works from a sub-maintenance station in the open-cut. Nightly, lube men check for fuel and oil leaks, check special fixtures, aim always to keep at least 18 rigs operative in the cut while allowing two in the shop for general or emergency overhaul.

What of the operation's twin troubles—abrasion and heat? To thwart abrasion, Kaiser maintenance men line dump beds with 1-in. Kaisaloy steel plate, claim it outwears manganese. Shovel dippers are hard-faced, particularly the heavy-wear areas. A waffle pattern is used, the job done at the pit with portable welding machines. Dozer trucks are protected by manganese pads. Heat, although bothersome at times, has little adverse effect upon the rigs, says Master Mechanic C. A. Scott. Rigs have standard radiators—the K-803's radiator capacity is 2800 sq. in. Only real precaution is use of treated water from a 2000-gallon reservoir chromated with Nalco #38. Because Eagle Mountain's water (piped from a well 8-miles to the east) is highly corrosive, Nalco is mixed double strength (.8 ounce to the gallon instead of .4).

Totally enclosed bulk oil handling further thwarts abrasion both from ore and sudden sand storms common to the Colorado. Daily, Eagle Mountain diesels burn about 2000 gallons of fuel (trucks alone use 1000-gallons). Underground storage holds 8000 gallons of lube oil for the Baldwin-Lima-Hamilton locomotives. Another 8000 gallons of fuel oil is held in underground storage, although ore trucks are fueled from tank trucks. All rigs have their oil filters changed every third week, which is equivalent to every 120-hours.

Tires, which find it hard going in mining, are checked after every shift. One man is assigned to this specialized job. Rock cuts are held to minimum because the short-haul distance is continually worked with crushed rock, watered by a Euclid tanker. Perpetual record is kept of every tire, its "on-off" history filed. Kaiser expects no less than two recaps, often gets more. Usually, by the fourth, carcasses have separated. Recap life usually equals new-tire life.

Meantime, diesel rigs are shuttling 700-tons of ore hourly between shovels and Eagle Mountain's primary crusher, the pit at 1460-ft. above sea level, the crusher at 1400-ft. What with high temperatures, heavy though short hauls, and as many as a dozen round-trips each hour, the K-803s will be experiencing a tough-service job-test.

An Eagle Mountain "team," consists of a shovel and a dieselized "sweeper," in this case a LeTourneau Tournadozer. The sweeper stands by to keep the spillage heaped within the shovel's range.

This diesel-driven churn drill hammers 9-in. drill bits to 35-ft. depths as a part of the primary blasting operation at Kaiser's iron ore mine.

In addition to the new Kenworth rear-dumps, a fleet of older Euclid and Mack dump trucks keep the ore flowing from the 30-ft. benches to the primary crusher.

The West Los Angeles central office of the General Telephone Co. of California which houses the largest single installation of Strowger Automatic Toll Ticketing equipment.

GENERAL TELEPHONE PROTECTS SERVICE WITH AUTOMATIC DIESEL PLANT

New 300-hp Fairbanks-Morse Engine, With Custom Built Controls, Starts and Picks Up Load Within Six Seconds In West Los Angeles Central Office

A new automatic diesel-electric plant has been put into service by General Telephone Co. of California to insure continuous operation of the General System's largest single installation of automatic toll ticketing equipment. The 300-hp Fairbanks-Morse diesel is part of the company's 1955 improvement program at the West Los Angeles Central office which involves the expenditure of more than $2,000,000. End result will be improved service, with customers able to dial directly nearly two million additional telephones in the Los Angeles metropolitan area.

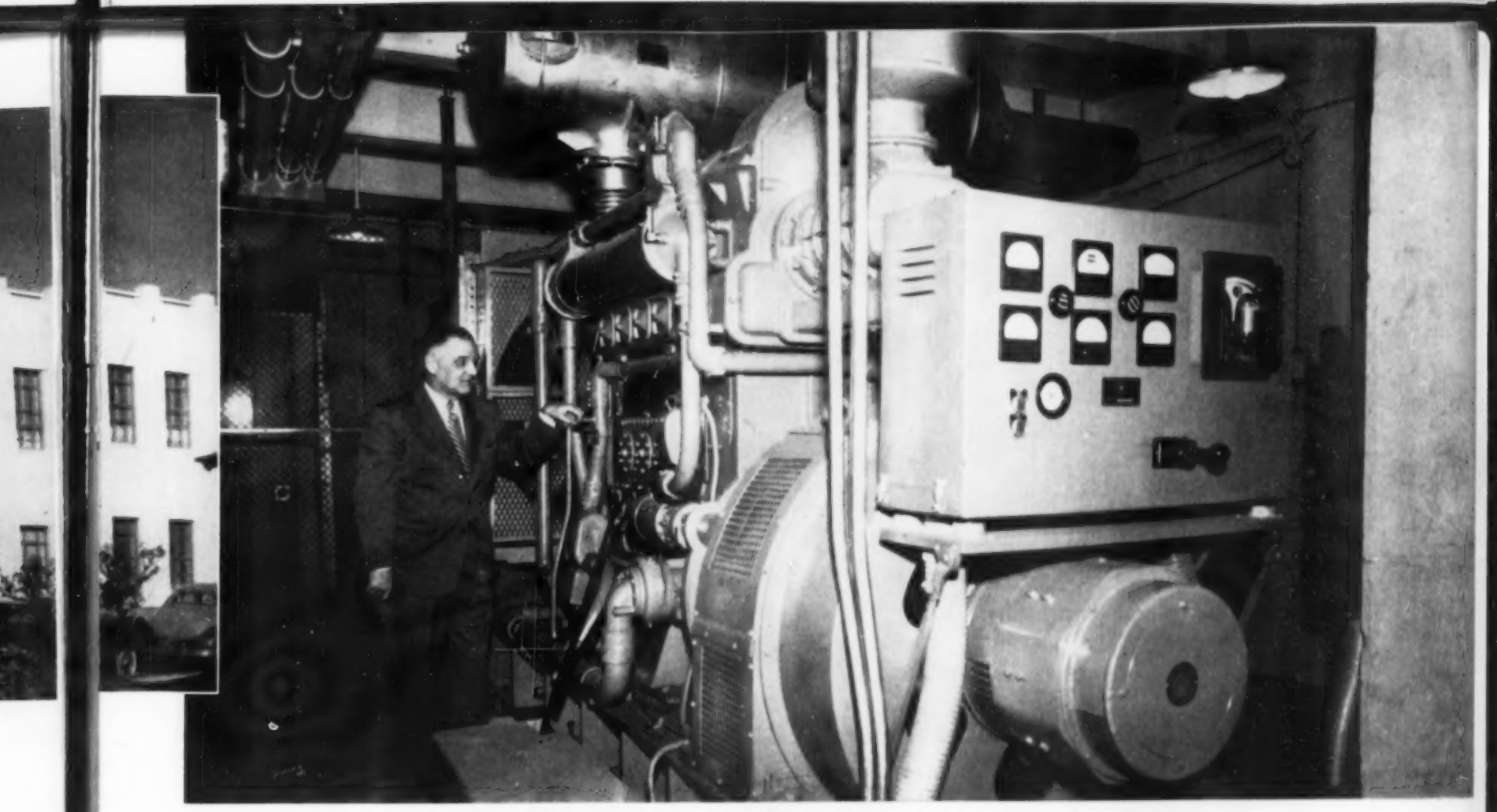
C. M. Davis, general equipment engineer, checks the Custom Built Controls which, on test, started the standby diesel and had it shouldering the single-phase load in less than six seconds.

The automatic equipment substantially increased electrical load and at the same time made it more imperative to prevent interruption of power supply. With automatic toll ticketing, each director shelf has its own 24-volt ac pulsing motor and each ticketer and tape perforator has additional ac power requirements. Failure of ac supply to this equipment even for very short duration could have serious consequences. Failure of power to the directors would result in complete loss of pulsing for the entire office and disruption of telephone service to the public. Loss of ac power to the automatic ticketers would mean loss of the entire AB toll billing for the period of power failure.

Two alternatives were considered to provide standby power protection: First, doubling the size of the storage battery installation to provide a five-busy-hour reserve for the increased electrical load; second, a two-busy-hour battery reserve with a diesel-generator to supply emergency ac requirements directly, provide dc current through motor-generator sets and rectifiers, and operate the charger. It was estimated that the five-hour reserve for the West Los Angeles office with its new automatic equipment would require an extremely large battery at a cost of approximately $78,000. In addition, special floors would have to be constructed to carry the additional weight. A two-hour battery would cost about $34,000 and a diesel plant could be installed for substantially less than the $44,000 difference. Space and foundation for the diesel would be less costly than the comparable charges for the five-hour battery.

Another consideration that influenced General Telephone's engineers was the diesel's longer service life. The battery would last a maximum of 15 years while a heavy-duty standby diesel should serve for 30 years. Also, unlike the battery, the diesel is capable of producing rated output continuously for an indefinite period, assuring continuity of telephone service regardless of the length of commercial power interruption. With a diesel to supply emergency lighting for vital operating rooms and equipment buildings, it also would be unnecessary to provide the customary 48-volt emergency lighting system. It was on the basis of these facts that C. M. Davis, General Equipment Engineer, concluded that a diesel-generator would pro-

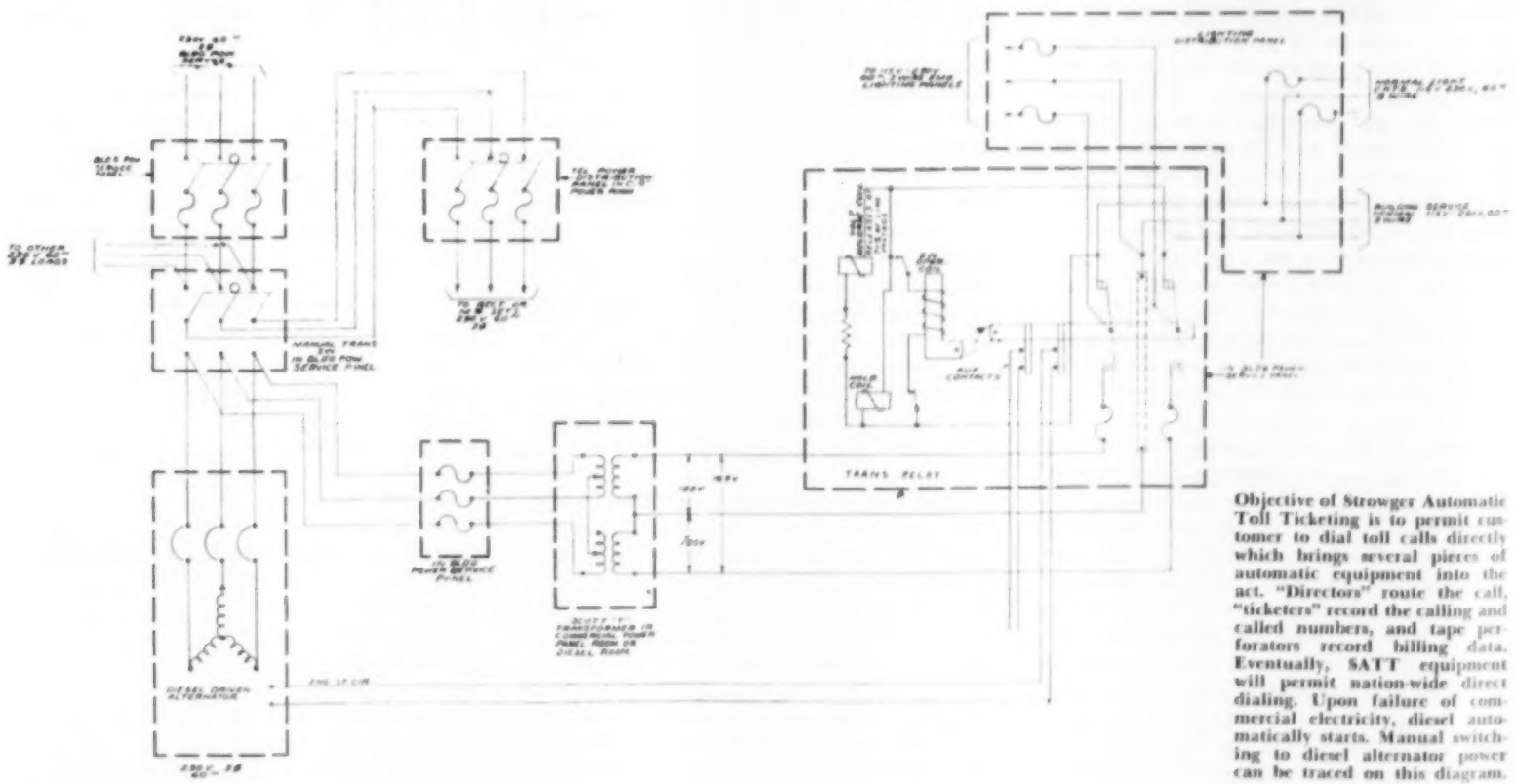
A CIVIL DEFENSE INSTALLATION



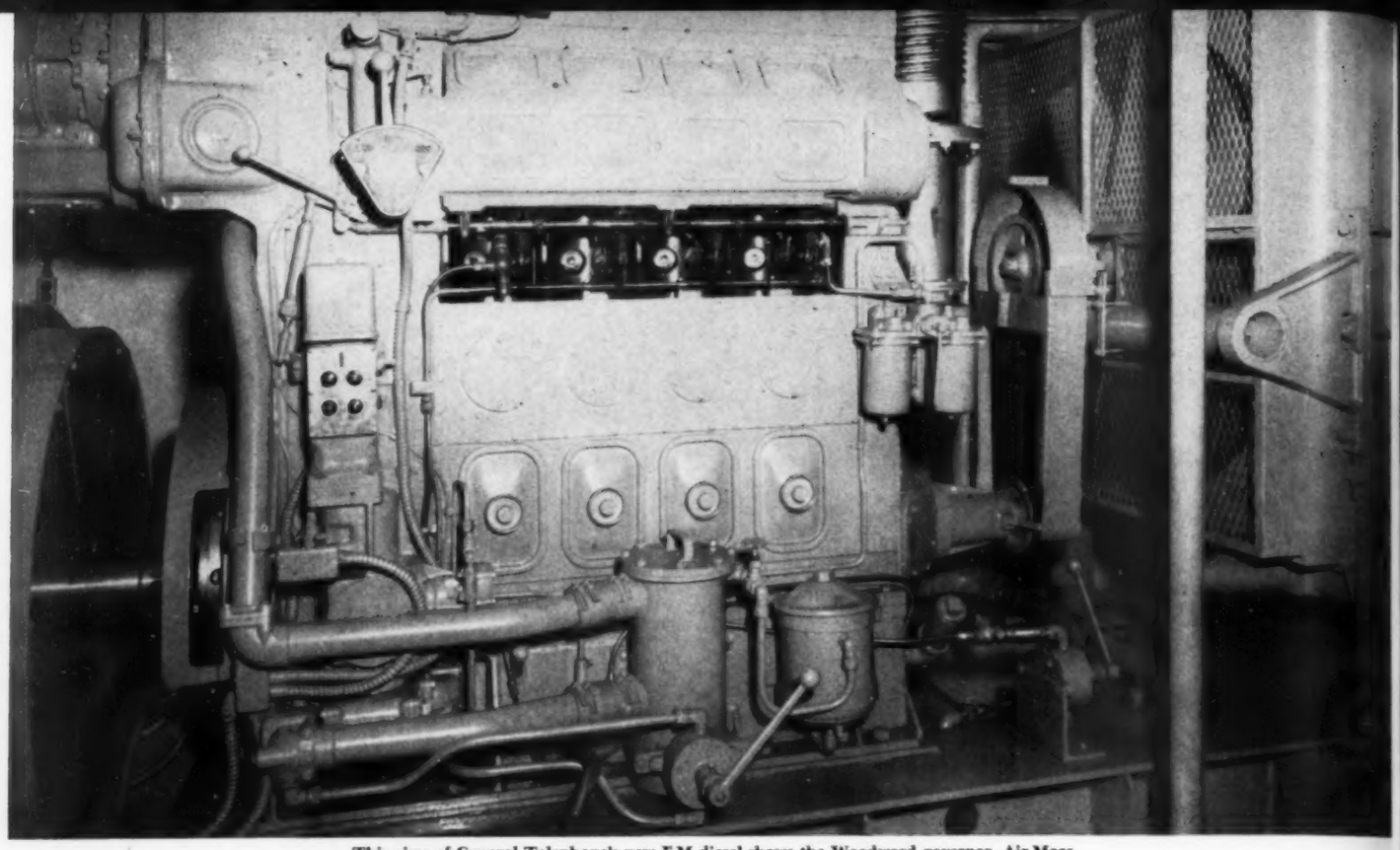
This new 300-hp Fairbanks-Morse opposed-piston diesel protects customer service and company billing against power failure. C. M. Davis is inspecting engine accessories which include F-M alternator with direct-connected exciter, Kewanee-Ross oil cooler, Burgess-Manning air filter and horizontal exhaust snubber.

vide the best and most economical standby power protection for offices and toll centers with automatic toll ticketing equipment.

The engine chosen for the West Los Angeles office is a Fairbanks-Morse opposed-piston, two-cycle diesel with four cylinders, 5¼-in. bore and 7¼ in. stroke, rated at 300 hp at 1200 rpm. The OP is a heavy-duty engine capable of long, efficient operation, yet is relatively light and compact. The 4-cylinder engine has an over-all length of just 7 ft. 10½ in. The diesel drives a 200-kw F-M alternator to generate 3-phase, 60-cycle, 240-volt current. The engine is arranged to start instantly and automatically upon failure of the commercial power supply. Normally, commercial power passes through an automatic transfer relay to the single phase 115-volt, 60 cycle, 3-wire lighting and service circuits.



Objective of Strowger Automatic Toll Ticketing is to permit customer to dial toll calls directly which brings several pieces of automatic equipment into the act. "Directors" route the call, "ticketers" record the calling and called numbers, and tape perforators record billing data. Eventually, SATT equipment will permit nation-wide direct dialing. Upon failure of commercial electricity, diesel automatically starts. Manual switching to diesel alternator power can be traced on this diagram.



This view of General Telephone's new F-M diesel shows the Woodward governor, Air-Maze lube strainer, Purolator lube and fuel filters and Deming priming pump.

Interruption of this supply closes contacts in the transfer relay which activate the diesel's solenoid-controlled electric starter. This starting system was tested in the presence of this reporter and the diesel started and picked up the emergency single-phase load within six seconds.

When the diesel starts, the current passes through a Scott "T" transformer where it is reduced to 115-volt, 3-wire, single-phase, then through the automatic transfer relay to the emergency lines. Thus, the diesel automatically picks up operating room lighting, "panic" lighting for the central office building, lights for operation of the manual switchboard, and power for the timing clocks on the manual boards. The 115-volt current operates the tape perforators and is reduced to 24 volts to run the ticketers and directors. The diesel also sends 3-phase 240-volt power to a manual transfer switch in the building service panel. By throwing this switch, an operator sends power to telephone equipment. Motor-generator sets and rectifiers convert it to 48-volt dc current to power dial switching equipment. The ac current also runs the battery chargers and powers the ringing machines.

The diesel at West Los Angeles was arranged not only for swift, automatic starting but also for quiet, dependable operation with a minimum of attention. The power unit and all accessories are installed in a small basement room. Engine and generator are mounted on a steel base which rests on vibration isolators. Exhaust gases pass through flexible hose to a horizontal snubber suspended from the ceiling, then up a pipe to the roof two stories above. Central Office Maintenance Supervisor, J. E. Scherrei, reports that there is no perceptible vibration in the operating room above and no engine noise outside the engine room.

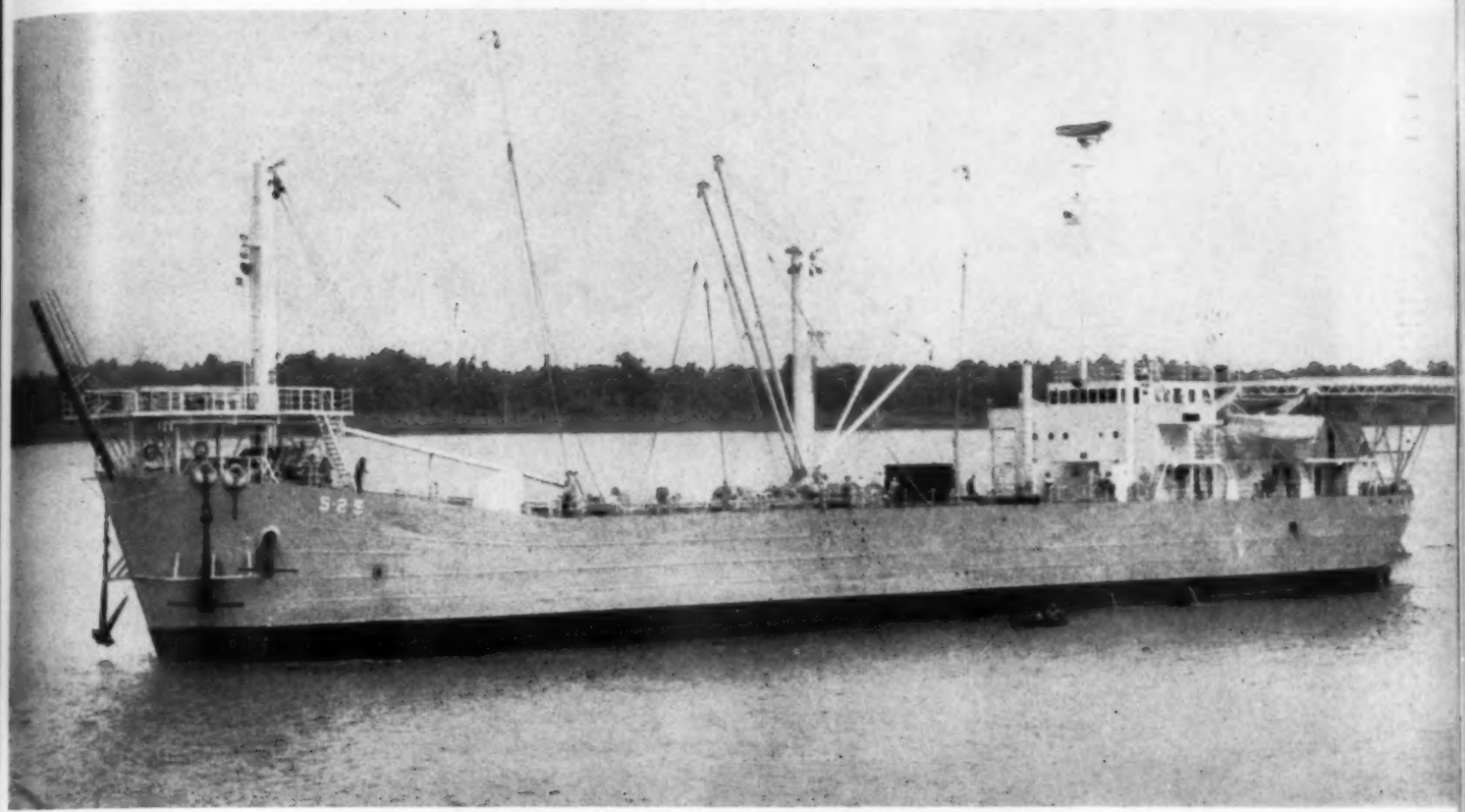
The engine is virtually self-sufficient with accessories mounted right on it or beside it on the steel base. Cooling water is circulated by an engine-driven centrifugal pump through the diesel and through an air-cooled radiator. The radiator fan is driven by V-belts from an extension of the engine's lower crankshaft. Lubricating oil is sent through the diesel under pressure by a built-in pump. Included in the lube circuit are a shell-and-tube oil cooler, a full-flow strainer, and a by-pass cartridge-type filter. Fuel oil from storage is pumped through a duplex filter before reaching the injection pumps. Scavenging air is drawn from the room through a filter mounted on top of the engine-driven blower. Air is ducted to the engine room from outside the building and is exhausted through another duct by a blower-type fan. The engine control panel with voltage regulator, voltmeter, ammeter, kilowatt meter, frequency meter and engine hour meter, is mounted above the engine's direct-connected exciter. Batteries for the diesel's electric starter stand beside the engine and are served by an automatic trickle charger. To protect the engine, there is an alarm and automatic shutdown actuated by low lube pressure or high jacket water temperature. The alarm also sounds if the engine fails to start after five automatic cranking cycles.

It is appropriate that General Telephone Co. of California should have the largest Strowger Automatic Toll Ticketing installation and the latest in automatic diesel plants to protect it. The company had an experimental SATT unit in its own Santa Monica building as far back as 1944. The California company, largest non-Bell telephone company in America, has consistently improved equipment at the same time that it expanded tremendously its service volume. By June 1955, General served 667,987 telephones in a seven-county area from the San Joaquin Valley on the north to Laguna Beach on the south and including about 25% of the population of Los Angeles county. Telephone plant was valued at $214,000,000 with another $100,000,000 scheduled to be spent in 1955, '56 and '57. The West Los Angeles exchange exemplifies the company's growth.On December 31, 1947, this office served 26,031 telephones and had an investment of $4,757,843 in telephone plant. On December 31, 1954, plant investment was $14,851,261. By August 1, 1955, the number of telephones served had reached 56,000.

The new opposed-piston diesel will insure uninterrupted service to two "cities within a city"–the University of California at Los Angeles with 1500 telephones, and the huge Veterans' Administration Center in West Los Angeles with 1400 phones. It is important, too, that the diesel will insure against interruption of billing.

List of Equipment

Engine—Fairbanks-Morse 300-hp, 4-cylinder, 1200 rpm, Model 38F5¼ diesel.
Generator—Fairbanks-Morse.
Governor—Woodward.
Radiator—Yates-American.
Lube oil cooler—Kewanee-Ross.
Lube strainer—Air-Maze.
Lube and fuel oil filters—Purolator.
Air filter and exhaust snubber—Burgess-Manning.
Electric starter—Leece Neville.
Vibro-Isolators—Korfund.
Starting batteries—Exide.
Trickle charger—Lester.
Engine control panel—Mowry.
Voltage regulator—Brown Boveri.
Electrical meters—Westinghouse.
Automatic controls—Custom Built Controls.



The California Company's new self-propelled drilling tender, the *S-25*, was converted from a Navy Landing Ship (Tank) by Avondale Marine Ways under the architectural direction of Friede & Goldman. The 327-ft. vessel is fitted out to service a drilling platform in the offshore oil fields of the Gulf of Mexico.

WARTIME LST'S BECOME PEACETIME DRILLING TENDERS

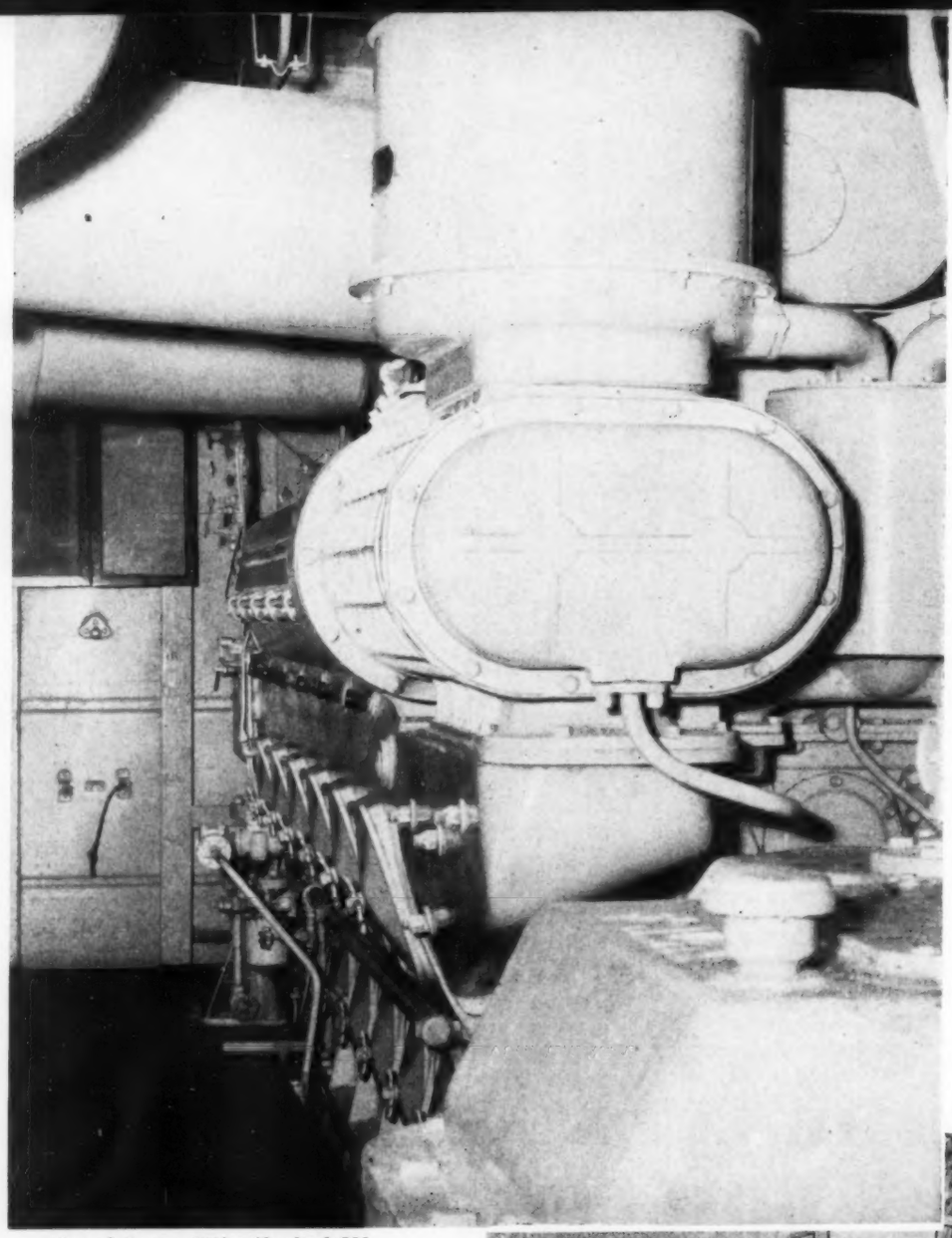
By JAMES W. CALVERT

SINCE 1939, oil men have been faced with the vexing and expensive problem of recovering oil from the rich fields beneath the waters of the Gulf of Mexico. In that year the first under-water oil wells were drilled off the coast of Louisiana, an area that since has developed into what may well be the most valuable group of petroleum properties in the world.

The beginning of World War II and the subsequent appearance of enemy submarines in the Gulf of Mexico quickly drove the oil men inland. They could hardly wait, however, for peace to return before they were back at sea in whatever makeshift craft they found available; criss-crossing vast expanses of water with seismic surveys and figuring out ways of building drilling rigs that could withstand the forces of nature. While the first three under-water oil wells, completed by Pure Oil Co. in 1938, were only a short distance from shore in shallow water, the first offshore well out of sight of land was brought in by Kerr-McGee Oil Industries in 1947 and is credited with launching the present deep water drilling boom.

Thus the discovery of oil in the Gulf of Mexico closely followed another far-reaching event that was important to the economy of the nation: the sale of surplus wartime material and equipment by the United States government. Many military strategists will argue that the war in the Pacific was won by the amphibious forces with their fleets of LST's, LCI's, LSM's and the various other types of expendable shallow water craft designed to deliver troops and guns to enemy held beaches. At war's end, with no enemy beaches to capture, the landing craft had little peace-time usefulness except in the oil fields off the coast of Louisiana and Texas. There they became as valuable, relatively, to the oil industry as they had been previously to our military forces abroad. Their shallow draft made them adaptable to the inlets, bayous and marsh flats that fringe the Louisiana and Texas coast while their peculiar design encouraged quick and simple conversion to the needs of the prospectors.

Even today, more than a decade since the war, oil men are still converting surplus amphibious craft and are building new vessels along the same basic design of the World War II landing ships. Especially has the wartime workhorse, the LST (Landing Ship Tank), met the peculiar requirements of the offshore oil industry. As an offshore drilling tender it satisfies every possible need. Its spacious tank deck provides ample room for the installation of mud tanks, pumps, generators, and storage facilities for the materials needed to drill a well. On its main deck, originally kept clear for the carrying of landing boats and other deck cargo, is ample room for the installation of pipe racks. Add a heli-



One of the two 900-hp Cleveland GM Model 12-567 diesels which provide propulsion for the drilling tender, *S-25*. Original engines in the Navy ship, they have been completely overhauled.

The wheelhouse is equipped with modern navigational and communication gear including the original Navy compass, radar, and ship-to-shore radiotelephone. Additional navigational equipment was supplied by Baker-Lyman Co., New Orleans.

copter deck, air condition the living quarters, install the modern machinery and instruments required for oil exploration, and you have a drilling tender that is tailor-made for the job.

The latest LST conversion for the oil industry has just been completed at Avondale Marine Ways, New Orleans, for The California Company. It is the self-propelled drilling tender *S-25*, costing more than a million dollars. This completely dieselized vessel utilizes her original Navy engines for the main propulsion plant, with new diesel engines of various types and capacities for the numerous auxiliary purposes called for in the exacting work of drilling an oil or gas well.

Any similarity to the original LST that pounded the beaches of Saipan is purely coincidental, however, for the *S-25* has been completely re-designed for her new occupation—that of serving as warehouse, power plant, machine shop, hotel and recreation hall, helicopter landing field, weather bureau and field office for a drilling rig at sea. Marine architects Friede & Goldman, Inc., New Orleans, redesigned the *S-25* to meet all requirements of the U.S. Public Health Service, The U.S. Coast Guard and the American Bureau of Shipping. The vessel is 327 ft. 9 in. in length, with a molded beam of 50 ft. and molded depth of 25 ft. Fully loaded, it has a draft of 12 ft. This shallow draft is essential to enable the ship to navigate the shallow bays and channels of the Gulf Coast area to reach its various drilling locations.

The original main power plant, consisting of two 900-hp GM 12-567 diesel engines, has been completely overhauled, as have the original three 100-kw, 120-140-volt generators which are driven by 150-hp Superior diesel engines. In addition, the company installed another generator unit of the same type as well as a 20-kw dc generator set powered by a 30-hp GM diesel engine, required as emergency equipment by the U.S. Coast Guard.

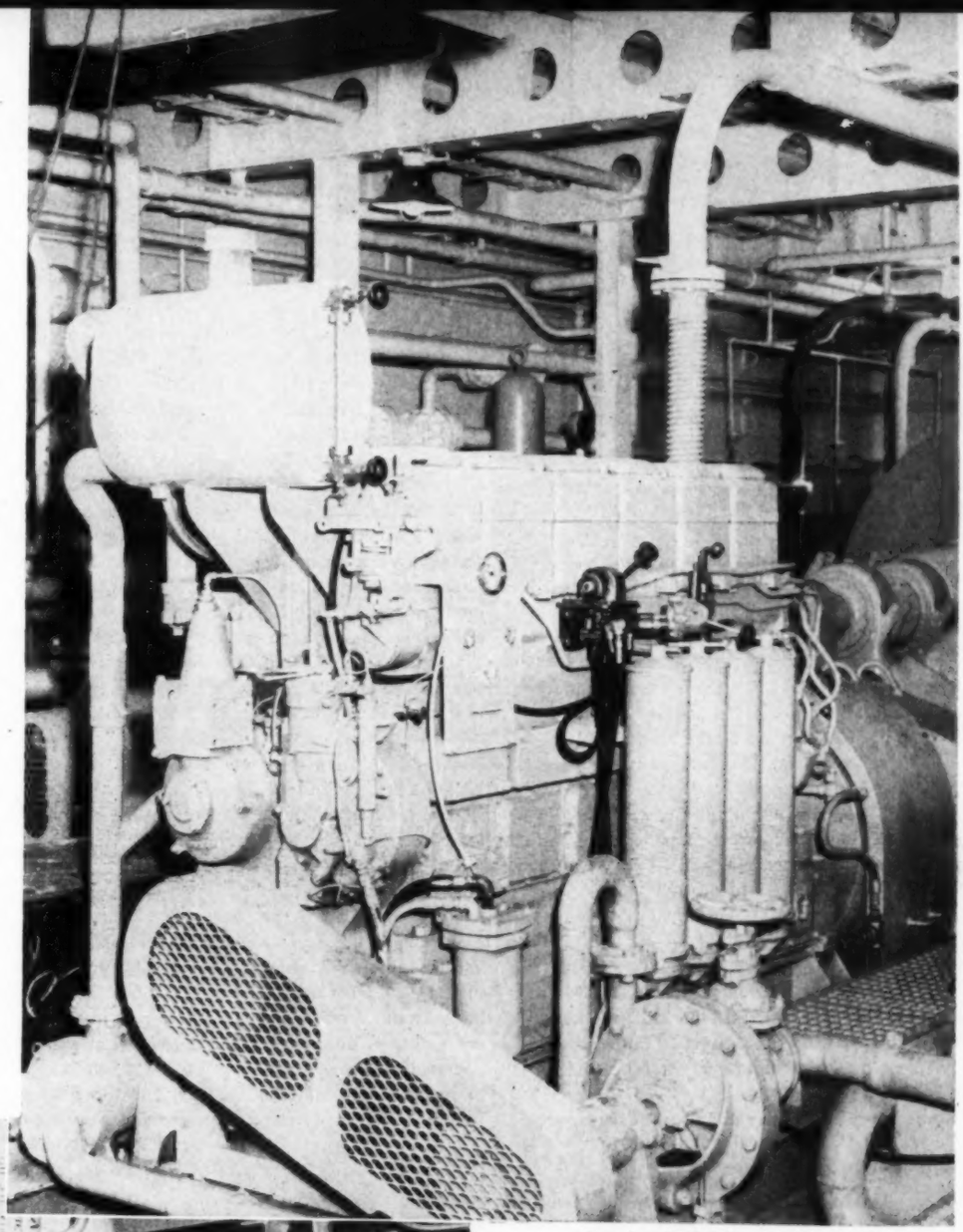
With this power, the ship has a speed of 10 knots, but speed or mobility is not the primary function of the *S-25*. As a drilling tender, her paramount function will be to ride at anchor, bow into the sea, with her mud, fuel and water hoses, plus a catwalk, attached to a permanent drilling platform. The California Company's new tender will be held in position by seven 10,000-pound anchors, four forward and three aft. These will be set in a pattern around the ship. Electrically driven wildcat windlasses make it possible to move the tender away

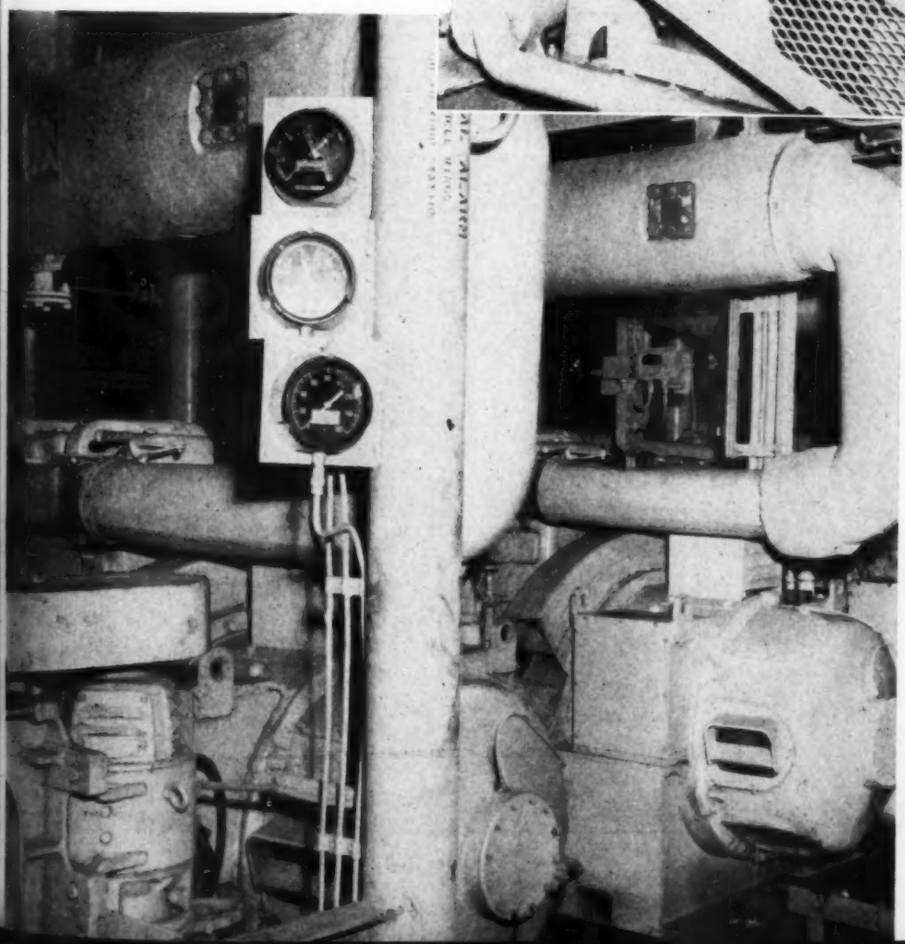
from the drilling platform or change her position rapidly at any sign of danger from high winds and seas. Deck cargo is handled by two kingposts which support six 5-ton booms.

To deliver drilling mud to the rig, the tender is equipped with three sets of pumps which are driven by dual-controlled Superior diesel engines, Model PTD-6, each rated 500 hp at 900 rpms. The main mud pump is a National C-350, while an auxiliary which can be put into service to supplement pressure or to take over in the event of a failure in the main pump, is a National C-150. In addition, there is a third set of mud mixers, built into the mud tanks. Halliburton oil well cement units are also powered by Superior diesel engines of the same model. Mud and cement are carried to the drilling platform from the tender by flexible quick-break connections which have hydrostatic tests of 5000 psi and 10,000 psi, respectively.

Personal comfort of the drilling crew is another major factor to be considered in the design of a drilling tender. The *S-25* has air-conditioned quarters for 116 men and is equipped with laundry, galley, dining hall, recreation hall, as well as the necessary offices and executive spaces. The modern galley is equipped with a South Bend diesel range, an ice maker and built-in freezer. The fully-automatic laundry has a washer and dryer. Potable water, and much of the drilling water, is provided by a Meco vapor compression evaporator system which has a capacity for distilling 7200 gallons of sea water per day.

Navigation and radio equipment aboard the *S-25* consists of the original U.S. Navy compasses, a 30-mile Sperry Gyroscope radar, a GE FM radiophone





Superior 150-hp diesel engines drive these 100-kw generators. These units were original equipment but were completely overhauled during the conversion job.

Superior diesels, now made by the White Diesel Engine Division of the White Motor Co., drive the two National Supply main and auxiliary mud pumps. The units deliver drilling mud to the offshore well.

and a RMC-AET PD-12-D ship-to-shore radiophone. The only wood structure on the vessel is a helicopter deck, mounted aft, surrounded by a nylon lifenet. Safety equipment includes two lifeboats, a complete fire protection system with automatic alarms, and a 30-ft. aluminum safety gangway to connect the tender with the drilling rig. A corrosion preventative system features an ALI-Co. rectifier with graphite anodes, operating on an impressed direct current of 12 volt, 150 amps, laying on the floor of the ocean beneath the tender.

This is the second such conversion undertaken by the California Company and a third is underway at Avondale Marine Ways. Indeed, the LST, once regarded as expendable as a spent shell, has found its place—and an important one—in the American petroleum industry.

*Mr. Clark is Superintendent of Municipal Utilities in Broken Bow, where, with from 17 to 20 employees, he directs operations of the water, sewer, and electric departments. Previously, he held managerial positions in the utilities of Beaver City, Nebr., and Hartley, Iowa.

BROKEN BOW, NEBRASKA

By L. E. CLARK*

THE Light Department of Broken Bow Municipal Utilities was able to reduce average electric rates from 2.98¢ to 2.69¢ per kw/hr in January, 1954. To the average consumer of this Nebraska city of 4000 persons, this meant a savings of $10.55 a year. To the Municipal Utilities, on the other hand, the resultant revenue loss during the first 12 months under the lower rate totalled $21,337.54. But in spite of this drop in gross income, the difference between income and expenses for the year ended April 30, 1955 was:

Income	$163,201.40
Expenses	106,084.99
	$ 55,116.41

Furthermore, the department pays $600.00 a month into the city's general fund in lieu of taxes, and it has contributed $110,000.00 into an improvement fund, set up to care for future needs.

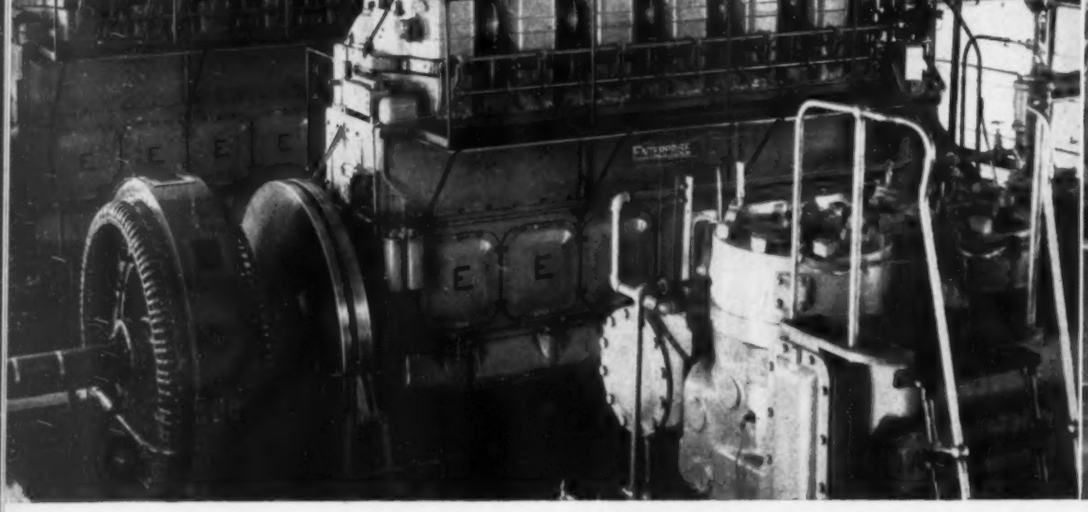
"How can you cut your rates and still have money for those funds?" I have been asked. Before I try to answer that question, I should provide some background by describing our plant and giving a little of its history. Broken Bow's first power plant was built in 1915 to operate street lights and pump water. It was equipped with a 35- and a 60-hp oil oil burning engine. In 1918, 1923, 1925, 1930, 1936 and in 1945 new and larger engines were added. All were diesels. The city also bought the competing electric utility in 1945. Thus ended a rivalry and competition that had begun with the inception of the municipal plant and which still makes good conversation for the old timers. The city had acquired 79% of the electric business before buying out its competitor and gaining 212 new customers.

Installed equipment now consists of three Fairbanks-Morse engines and two Enterprise engines with a total generating capacity of 4910 hp or 3340 kw. Unit No. 1 is a Model 33D16 750-hp diesel. Installed new in 1936, it generates 500 kw but now is used for standby. When load requirements dictate, it will be converted to dual-fuel. No. 2 engine was purchased in 1930 and also is a Fairbanks-Morse, — a Model 32 of 360 hp providing 240 kw. This was the very first Model 32 to be converted to dual-fuel operation and utilizes equipment of our own design. It has successfully operated on natural gas since July 1953. United States patent No. 2,719,516 has been issued in connection with this development and other patents are pending. No. 3 is a Model 38E 16 F-M diesel purchased in 1945. Its 1200-hp produces 800 kw but it has been used for standby service since 1951 due to high fuel oil costs. This engine is currently being converted to dual-fuel operation. This conversion will incorporate the very latest in engineering research. It is expected that the engine will operate with 33% less pilot oil than current models now in use. No. 4 unit is a Model DGSQ38 Enterprise, rated at 1140 hp or 800 kw. No. 5 is a Model DGSQ38 Enterprise rated at 1460 hp or 1000 kw. Both of these latter engines were new in 1948, but we bought them after about 10,000 hours of operation in 1951 and converted to dual-fuel.

This equipment should be ample for the city's needs for the next three or four years. An original investment of $10,000.00 has grown into one of about three-fourths million dollars, all through plant revenue. A total of 349 commercial and 1233 residential customers are served. The reputation of the plant is such that it has been featured five times in national trade magazine advertisements. Also, engineers from the Enterprise Engine and Machinery Company have used its records and equipment for developing new intercooling equipment which helps our plant materially.

The years immediately following World War II produced the most spectacular gains. In 1945, production increased 19%, due in part to the addition of the news customers, but also due to

The latest engines installed in the Broken Bow utility are Enterprise dual-fuel. One is rated 1460 hp at 326 rpm; the other is rated 1140 hp at 327 rpm. Both are equipped with Elliott turbochargers and drive Elliott generators.



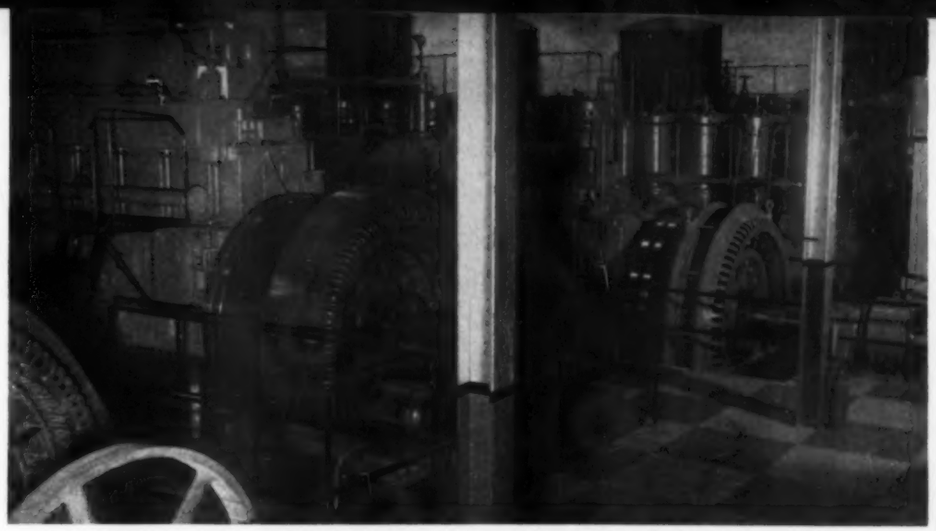
The Broken Bow Municipal Utilities power plant houses five engines. Besides the newest Enterprise dual-fuel units, there are three Fairbanks-Morse engines. The plant has a total capacity

the release of new appliances following the restrictions of war years. Addition of 102 new customers in 1946, caused that year to show a 45% increase in load. Lesser gains, but still far above the average, were shown for the years 1947 to 1949. Most of this business was due to new business and industrial load. The load curve leveled off for the years 1950 through 1952, due mainly to the exodus of workers to defense and military positions caused by the Korean conflict. The influx of television and other high use appliances created a new upswing in electrical use for 1954 and 1955. The rate of increase is again nearly 10% per year.

By 1950, two problems confronted the city. Production had increased to about 5½ million kwh per year, exceeding the firm capacity of the power plant. Diesel fuel oil, formerly costing 6½ cents per gallon, had increased to 11¾ cents, adding more than $25,000 per year to production costs. Several propositions for purchased power were presented at the time new generating equipment was being considered. One of these offered wholesale rates lower than the standard rates for other cities in the state. This low offer had its repercussions but failed to prove as cheap to Broken Bow as local generation.

Instead, two Enterprise diesel engines were purchased which had been used for the construction of the Harlan County Dam at Republican City, Nebr. This equipment was modernized for use with natural gas as a fuel and installed in a new addition to the power plant building. One-third of the former generating cost is now saved by the use of natural gas for fuel. This new saving amounts to more than $3,000.00 per month and largely accounts for net operating profits in the face of lower electric service rates.

The cost of this last installation of equipment, of 4910 hp or 3340 kw. The Model 32 F-M has been converted to dual-fuel operation, and one Model 33 is being converted at this time.



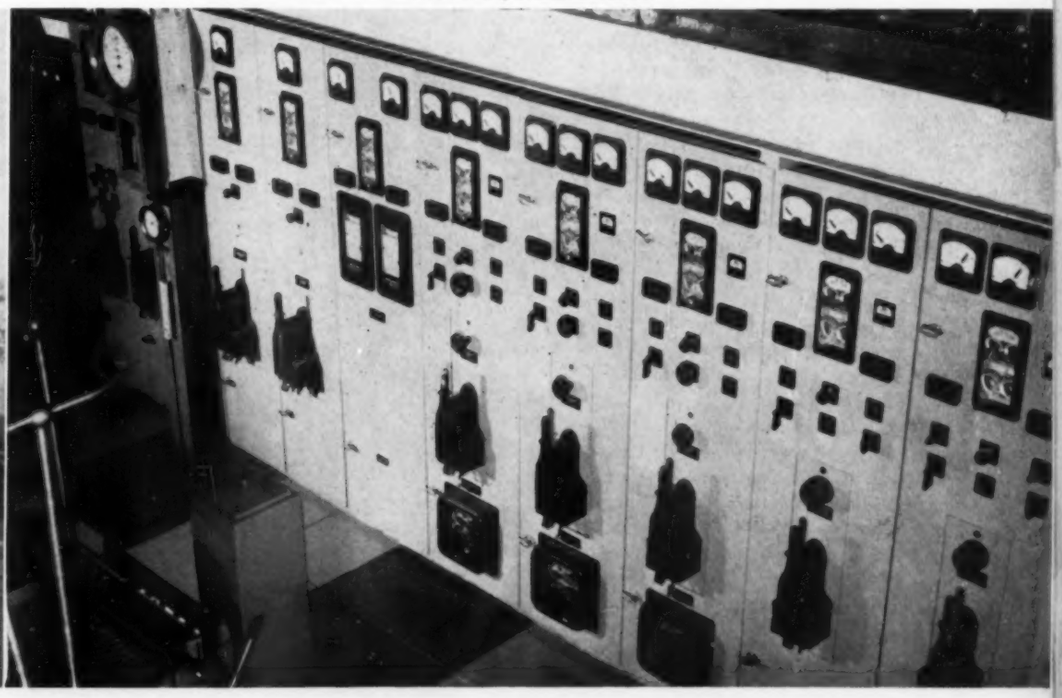
The corner of the Elliott generator on the No. 5 (Enterprise) engine is the foreground, followed in order by the Enterprise DGSQ-36, the Model 33F16 Fairbanks-Morse, the Model 32 F-M, and the Model 33D16 F-M.

$217,944.00, was partly financed by a bond issue bearing interest at 1.4%. In 1945, $140,000.00 in revenue bonds had been issued to pay for the 1200-hp Fairbanks-Morse engine and competing electric system. These bonds were paid off six years ahead of schedule. This was all accomplished before the advantages of dual-fuel operation became available. The Light Department became debt free in January of 1954. Part of operating profits are now regularly invested in government bonds to accumulate into a $250,000.00 improvement fund. By the end of 1955 the investment in this fund will be half way to the goal.

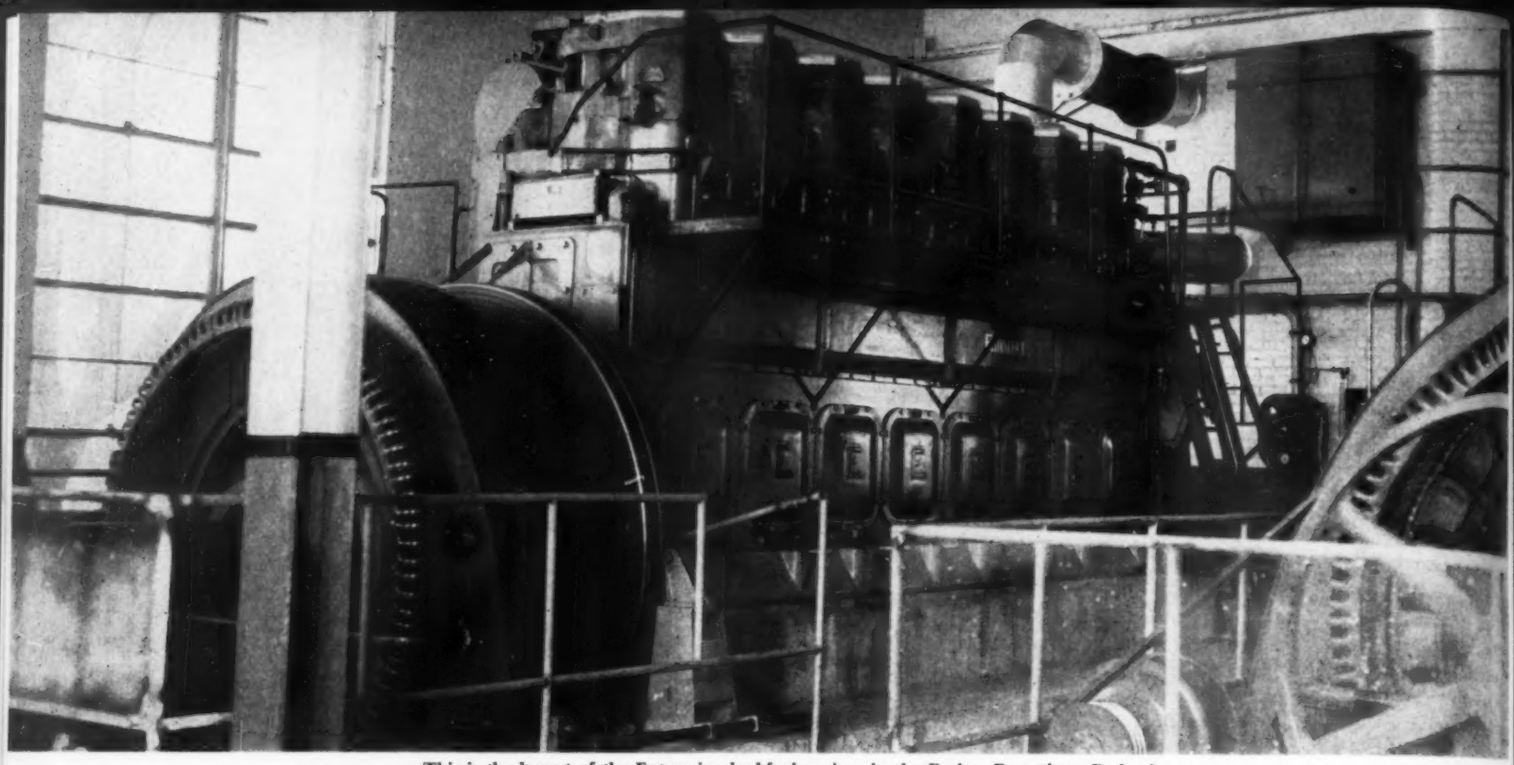
Actually, there have been two recent rate reductions, one effective in February 1953 and the other January 1954. These reduced potential net earnings by more than 30% and passed along savings to customers amounting to $24,000.00 per year. Rates in Broken Bow are expected to be progressively lowered in the next few years. Another stage in this series of reductions is now being considered. This proposed cut will follow the last one by less than two years and will save customers another 10%. The following comparison of operating profits for the years since 1945 illustrate the Department's growth.

Year	*Operating Profits*
1946	$ 8,885.69
1947	16,416.78
1948	27,610.40
1949	33,829.96
1950	45,939.56
1951	50,055.51
1952	58,351.87
1953	64,165.25
1954	59,625.71
1955	55,116.41

During the summer of 1953, Broken Bow made



The plant control panel. Supt. L. E. Clark has developed a unique "metered maintenance" plan to keep operating and maintenance costs low. "No unit is under-maintained nor wastefully over-maintained."



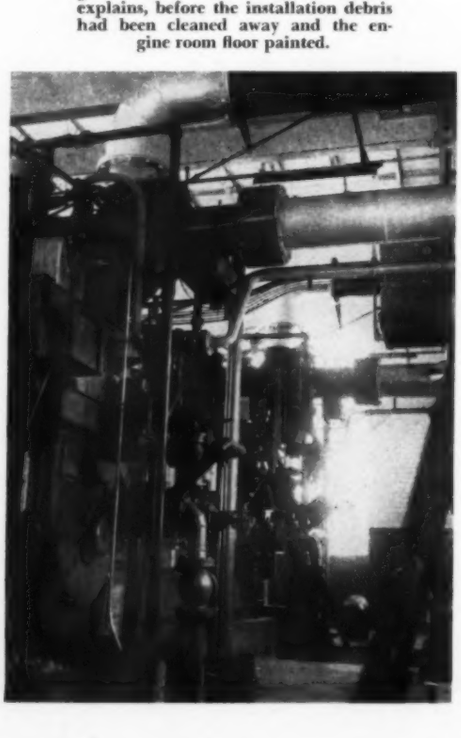
This is the largest of the Enterprise dual-fuel engines in the Broken Bow plant. Both of the new engines turn Elliott generators and have Elliott turbochargers. Alarms on the engine are by Custom Built Controls. Fuel oil filters are by Purolator and Winslow; lube oil filters by Cuno and Winslow. The air intake filters are American Cycoil.

the first installation of no-ballast type mercury street lighting to be sold in the nation. At that time, 75 luminaries were installed. In 1954, 75 additional street lights of the same type were installed by the city crews. This gives the Broken Bow business area one of the most modern and complete street lighting systems in the state. The City's water and sewer departments are operated in conjunction with the electric department. Water is now pumped from five wells having a capacity of 1600 gpm and is stored in an under-ground reservoir. A sixth well will add to this capacity early in 1956. A seven- or eight-year modernization program has progressed into the fourth year. Each year two or three carloads of new water main are installed in the distribution system. This work is done by city crews and no bonds are issued to pay the cost. This year's improvements will cost about $20,000.00. Water customers number 1218.

The Board of Public Works members are: W. G. Armstrong, chairman; Melvin G. Ayers, secretary; and James W. Melville. Dwain Williams is Mayor and City Council members are: Howard Province, Ralph McCloughan, Kenneth Lyddon, and Ted Forsyth.

Now we will answer the question as to how we have reversed the trend to higher rates and still remained financially robust. As already indicated, the change to natural gas for fuel was the major factor. Then, increased capacity and efficiency was attained by the intercooling system developed here which cools the air taken into the gas-burning engines. Since the intercooling equipment was installed, fewer engines are required to carry the load even though the load has increased. The Enterprise engines can be over-loaded by 20% without any bad effects, and temperatures and pressures remain normal, winter or summer. We have put some other equipment on our engines too, which have added to their efficiency and economy. One item is a variable gas pressure regulator which is operated from the governor. Regardless of the load, we never have to make any adjustment of our gas pressure. In other words, pressure is kept automatically at maximum efficiency at all times. And, to give us a check on our efficiency, we installed a gas flow meter. We have Roots Connersville gas meters for each generating unit. To these we have applied flow meters designed on a tachometer principle at a cost of only $25.00 per unit. It provides a quick means of adjusting our air-gas ratio to give use the highest efficiency.

Front view of the two Enterprise engines. Photo was taken, the author explains, before the installation debris had been cleaned away and the engine room floor painted.



Auxiliary manual air controls also have been installed on our Enterprise engines. Air control conventionally is governed by a cam operated from the governor. But, with certain atmospheric and load conditions, we find we can get greater efficiency by manually adjusting the air. Now, we follow the practice of adjusting our air according to our exhaust temperatures. This is easy for the operator to do.

Probably our most valuable device for keeping maintenance costs down is our unique "Metered Maintenance Plan". Individual maintenance procedures are scheduled according to the all important time meter. No unit is under-maintained or wastefully over-maintained.

All our personnel have the realization that little things which may cut production even a small fraction of a mill per KWH will result in thousands of dollars in savings per year.

List of Equipment

Main engines—(Two) Enterprise; 8-cyl, 16-in. x 20-in., 1460 hp at 326 rpm; and 6-cyl, 16-in. x 20-in., 1140 hp at 327 rpm.
Turbochargers—Elliott.
Governors—Woodward.
Compressors—Quincy.
Generators—Elliott.
Exciters—General Electric.
Fuel oil filters—Purolator and Winslow.
Lube oil filters—Cuno and Winslow.
Alarms—Custom Built.
Air intake filters—American Cycoil.
Exhaust muffler—on 8-cyl. engine, Burgess on 6-cyl. engine, Maxim.
Exhaust pyrometers—Alnor.
Jacket water pumps—Ingersoll-Rand.
Cooling tower—Diesel Service Co.
Cooler—on 8-cyl. engine, Ross. On 6-cyl. engine, E. C. Cooley Co.

The M/V "Mary B"

ONE of the busiest boats on the Missouri is the 3200-hp M/V *Mary B*, repowered and rebuilt in 1955 to adapt her for operations at a draft of 5½ ft. The B & M Towing Co., Houston, Texas, owns the twin-screw towboat. Alterations and repowering was done on the ways of the Nashville Bridge Co., Nashville, Tenn.

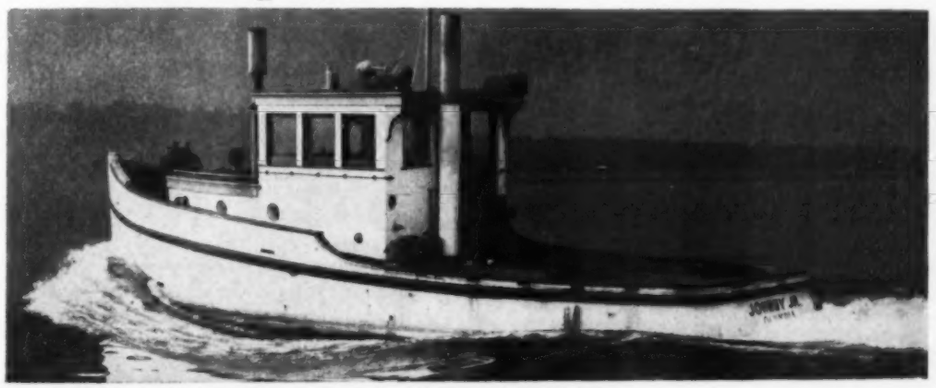
Objectives in mind when it was decided to modify and repower the vessel were greater power and speed, lighter weight, and shallower draft. The owners believed this modernization was essential to keep pace with the increasing competition and growing traffic on the Missouri-Mississippi waterways system. Before her purchase in June 1954 by the B & M Towing Co., the towboat had been known as the *Twin Cities*, owned by the Lake Tankers Corp. She was built in St. Louis in 1940 and her slow-speed engines had established an enviable record along the rivers.

The new owners remained loyal to Fairbanks-Morse when they chose their new engines. They installed Model 38D8⅛ F-M 10-cylinder opposed-piston engines, each rated at approximately 1600 hp at 720 rpm, driving through Model 157-100 Falk reverse reduction gears. The engines removed had served efficiently for about 14 years, but their weight (75,200 lbs.) was excessive and their horsepower inadequate for the type of schedules the new owners had in mind. The Fairbanks-Morse engines removed were Model 37E14. Operating at 300 rpm, they delivered 690 hp each—a total of 1380 hp as compared to the 3200 hp now available.

Modifications to the hull in preparation for the installation of the new diesels consisted of reworking the bottom plating and forming new aft lines, plus the installation of new struts and Nabrico stern tubes of the same type as was installed on the *Harriet M*, another B & M boat. For auxiliary power, two Model VD 1091 International engines were installed to drive two 100-kw, 115-volt generators. To insure safety for the crew, a bulwark was added completely around the main deck which also added strength to the hull. New rubber tile flooring, an air conditioning unit, a clothes dryer, radar equipment, and a fresh paint job, inside and out, were also accomplished in the Nashville Bridge Co. shipyard at Nashville.

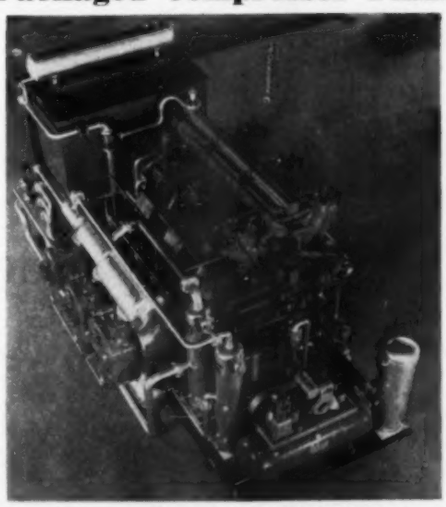
The *Mary B* has dimensions of 140x34x8½ ft. She was placed on the Nashville Bridge ways in late January 1955 and was returned to service on May 1. After nine months of active duty with her new engines, her owners and personnel of Nashville Bridge are mutually proud of the conversion job and of the vessel itself. The towboat's name honors the charming wife of Louis Blackburn, the "B" half of the B & M Towing. Robert C. Meyer is the other half of the ownership.

Harbor Log Boat



OLYMPIA Towing Co. of Olympia, Wash., uses this Cummins powered "harbor log" boat in a log pond to assist the boom men in the rafting of logs and the towing of rafts. The *Johnny Jr.* is powered by a Cummins NHM-600 diesel, which produces 200 hp at 2100 rpm. The NHM-600, driving through a Twin Disc MG-166 marine gear, with a reduction of 4.38 to 1, swings a 44 inch x 30 inch three bladed propeller. Olympia Towing puts about 3000 hours of service a year on the *Johnny Jr.'s* Cummins Diesel. The boat's dimensions are 38 ft. x 11 ft. x 4 ft.

Packaged Compressor Plant

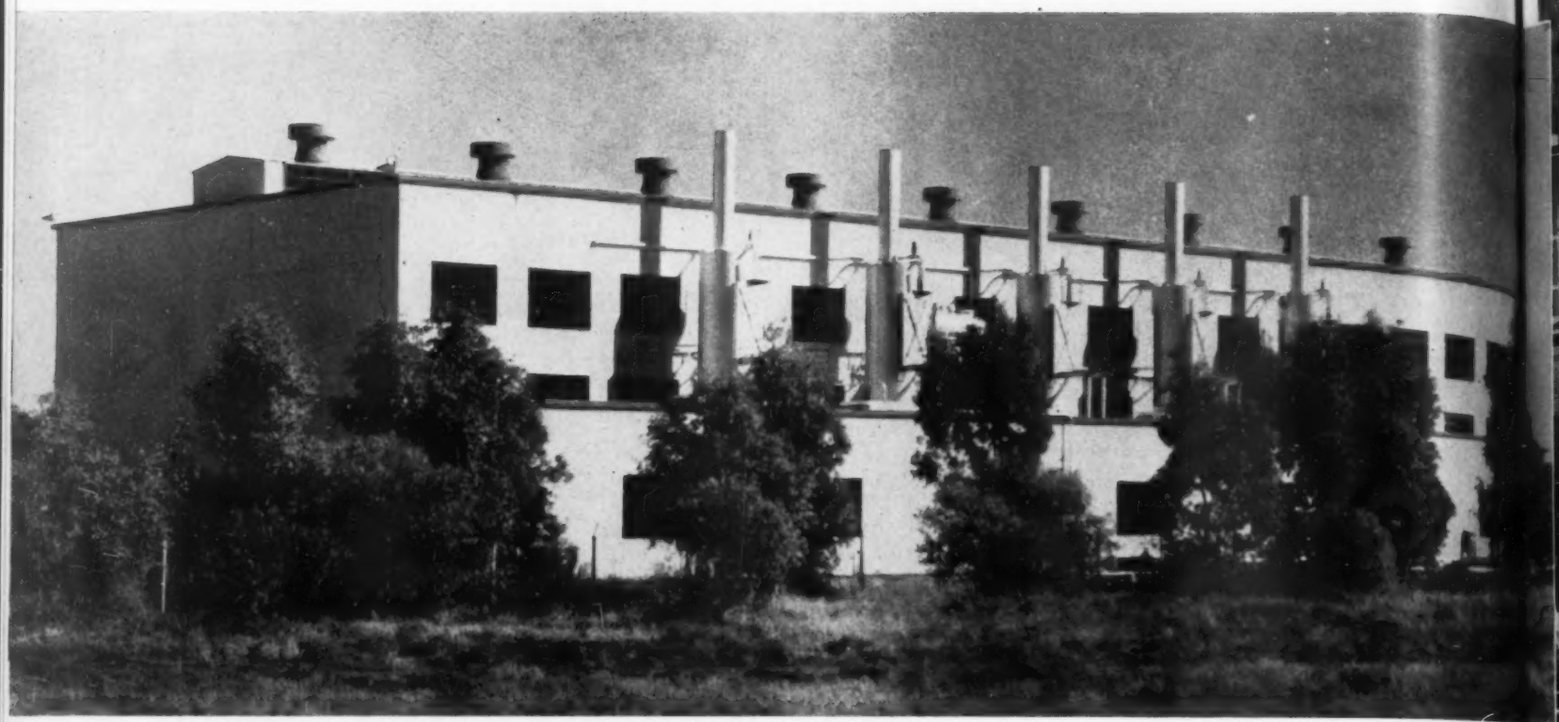


THE booming growth in recent years in the use of natural gas has led to the design and manufacture of a considerable amount of specialized equipment. Manufacturers in the diesel industry, and others affiliated with the industry, are among those who have met the challenge presented by the special problems involved in handling gas. Packaged engine-driven compressor plants are outstanding examples of gas-handling equipment now being sold extensively.

While the skid-mounted unit in the accompanying photograph is a product of Southwest Industries, Inc., Houston, plants to perform similar services also are built by J. B. Beaird Co., Shreveport, La., Bovaird & Seyfang, Bedford, Pa., and Stearns Rogers Co., Denver. The packaged compressor plants are designed to operate unattended in the field, burning gas which previously was frequently wasted by flaring. Automatic controls and safety devices therefore are a vital part of each installation. In some instances, the flare gas has been captured by the plants and sold, in addition to firing the compressor engines. When life of the wells end, the plant can be picked up and moved.

The engine on the compressor unit pictured is a 375-hp Model BMXA-6 Cooper-Bessemer. It has a Smithco radiator, Burgess-Manning exhaust snubber, and Commercial Ful-flo oil filter. The automatic control and safety features are provided by Amot thermostatic valves. A Model 3B Amot valve can be seen on the water line between the engine and radiator. A Model 2½B Amot valve is shown in the lube oil control line, back of the compressor and next to the Commercial lube oil filter unit.

The Southwest packaged compressor plants have three stages of compression, raising the field gas from 30 to 750 psig for gas lift, or to 1000 psig to feed into sales lines. In some instances, to insure uninterrupted operation, two small units are installed instead of one large one.



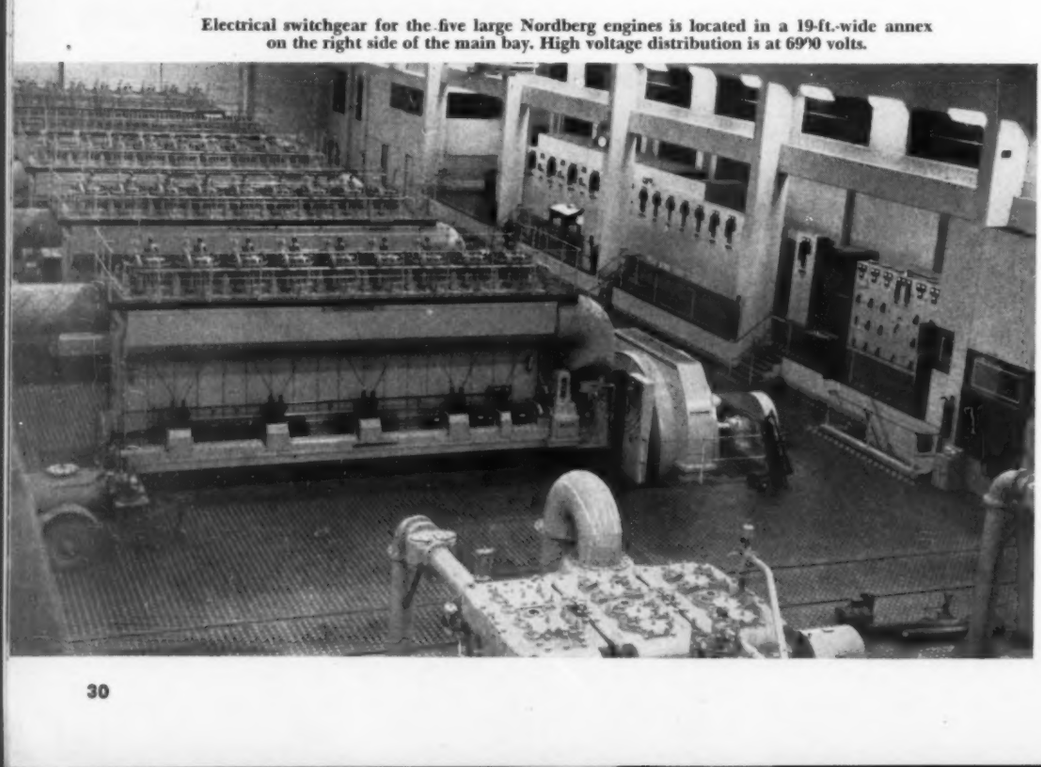
Modern in every respect, the design of this Australian power station is indicative of its overall efficiency. Because it is located in a dry, dusty area, the plant is air conditioned, assuring ideal working conditions for station personnel.

BROKEN HILL MINES, AUSTRALIA

WITH an installed capacity of 11,850 kw, the Southern Power Station at Broken Hill, New South Wales, Australia, presents a striking example of the efficiency of modern diesel-engined plants. Here five Nordberg two-cycle diesel engines, each rated 3345 bhp, 2370 kw, are generating power at an average of 16.557 kw/hr per Imperial gallon of fuel oil in providing power for mine and mill operations at Broken Hill. Since the first unit went into service in June 1950, the plant to June 1955 generated a total of 66,175,400 kw/hr.

Dependence on diesels, however, is not new to this Australian group. Prior to 1931, each of the mines at Broken Hill generated its own power, but from July of that year the entire requirements of North Broken Hill Ltd., Broken Hill South Ltd., and the Zinc Corporation Ltd., for both electrical energy and compressed air, were met by a central diesel station. It was erected as a result of an agreement between these companies and operated by Western New South Wales Electric Power Pty. Ltd. Power was furnished by 12 diesels totaling 28,562 hp.

Electrical switchgear for the five large Nordberg engines is located in a 19-ft.-wide annex on the right side of the main bay. High voltage distribution is at 6900 volts.

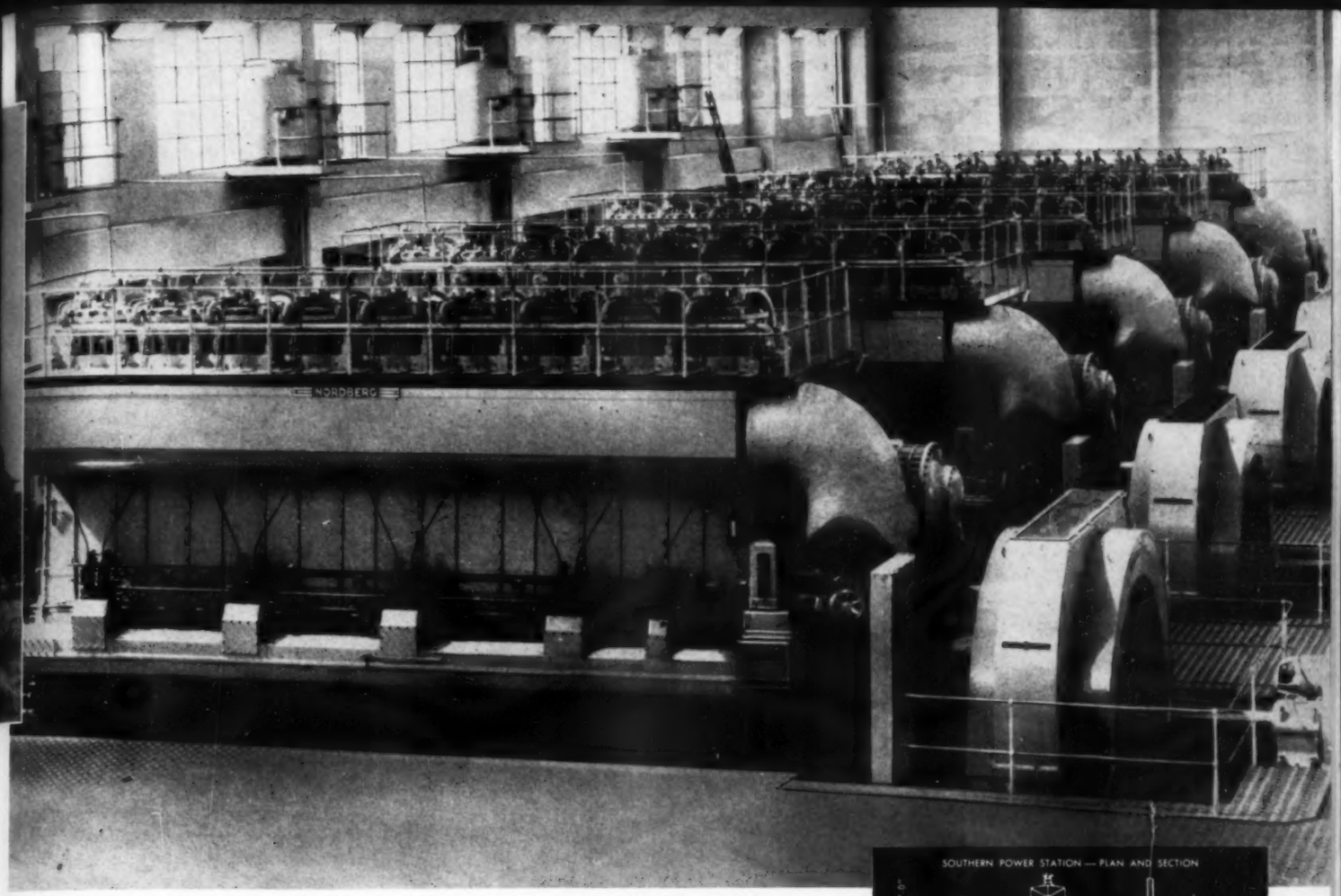


Following World War II, the demand for power increased very rapidly. As a result, the equipment at the central power station was duplicated. The new Southern Power Station was built to meet the requirements of New Broken Hill Consolidated Ltd. and of any development that may be undertaken to the southward of this company's leases. It will assist the central station and is operated by The Southern Power Corporation Pty. Ltd., a subsidiary of Consolidated Zinc Pty. Ltd.

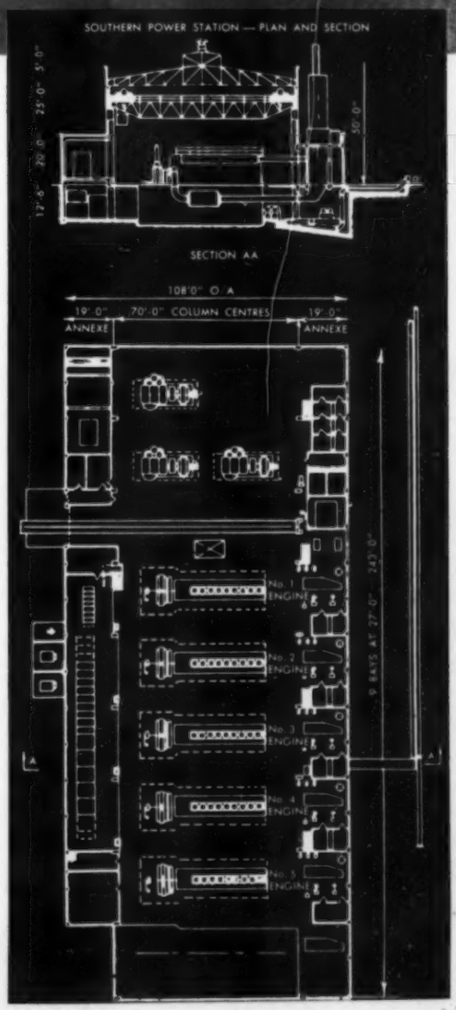
Preliminary design of the station began in late 1948 and excavation of foundations started early in 1949. Meanwhile at its Milwaukee Works, Nordberg began building the five large diesels—each of the two-cycle, solid injection type with nine cylinders of 21½-in. bore. These engines were built for a continuous rating of 3345 bhp, 2370 kw each at 110°F ambient temperature and 1100 ft. altitude.

Following erection, each engine was disassembled and packed in 50 large wooden cases for shipment to Australia. Heaviest pieces were the 38-ft. crankshafts each weighing 20 tons. Shipped to Sidney, these cases were then loaded on railway flat cars on the wharf and moved directly to the installation site. To facilitate easy handling, a railway line had been laid into the building at an early stage and a 20-ton electric crane installed.

Completed in 1950, the main bay of the power station is 243 ft. long, 70 ft. wide and 50 ft. high.



Main bay of the Southern Power Station with five Nordberg 2-cycle, 9-cylinder generating units, each rated 3345 bhp or 2370 kw.



Arrangement drawing shows location of five Nordbergs with their GE generators, three two-stage Alley-MacLellan air compressors, lube oil filters, fuel and jacket water pumps, and the main switchboard.

The five generating sets and three air compressors are installed in the main bay. Side bays, 19 ft. wide, provide for engine auxiliaries on one side and electrical switchgear on the other. There is space remaining for one additional generating set and another compressor. In addition, major auxiliary equipment is housed in the basement beneath the main operating floor. The layout permits easy extension of the building to accommodate several more diesel-generator sets or compressors if required at a later date and the site will allow duplication of the entire power station, if necessary to meet power demands in the future.

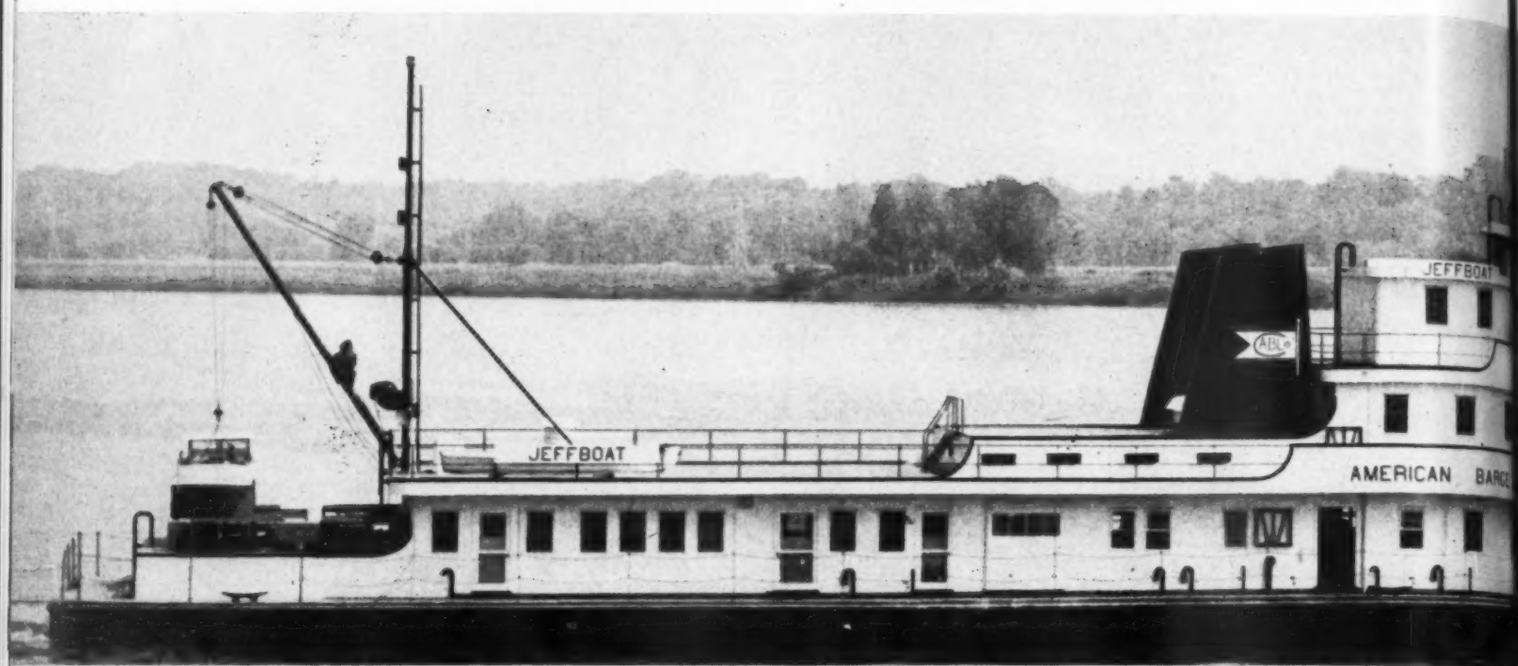
The generated electricity is controlled from the main switchboard located in one of the side bays. The output is sent to New Broken Hill Consolidated by direct feeders and may be tied electrically to that of the central power station by a direct tie line between the bus bars of each station.

High voltage distribution is at 6900 volts, 3-phase, 40 c/s. Substations have been built at the main hoist house and at the mill, where further high voltage distribution is made to substations located underground and low tension distribution is made for power and lighting on the surface.

Fuel oil storage at Southern Power Station consists of two tanks of 200,000 gal. capacity and one of 1,000,000 gal. The fuel oil is brought in by rail from Port Pirie in a fleet of 5000 and 10,000 gal. rail tank cars. Lubrication oil is also handled in bulk quantities. 1300 gal. sealed containers are brought in by rail and the main storage consists of two 10,000 gal. tanks. Pumps for transferring both fuel oil and lubricating oil to the engines are located in a small pump house close to the storage.

Typical of the station's modern design are the arrangements made for waste heat recovery. A distilled water circuit, specially treated to prevent corrosion, is used in both the diesel engine and air compressor cylinder jackets. The heated jacket water and oil from the piston cooling system are circulated through heat exchangers, which transfer the heat to mill water from New Broken Hill Consolidated where it is used advantageously in the flotation process for metal recovery. Engine exhaust gases are used for heating water for the locker rooms at the mine and the power station itself. Some of this hot water is also evaporated and condensed to provide make-up for the distilled-water packet-cooling system

Increased demands are to be made on this station when the three main mine hoists at New Broken Hill Consolidated are operated to greater capacity and another section of the mill begins operations. One of these three large hoists was built by Nordberg and operates an auxiliary double deck cage with a capacity of 30 men. The Southern Power men, all proud of their plant, look forward to the increasing test of their efficiency.



The *Jeffboat* is one of the three towboats on which American Air Filter "cycoil" filters were installed. This photo was made before the air-cleaning apparatus was installed. The vessel is powered by two Fairbanks-Morse 1600-hp opposed-piston diesels.

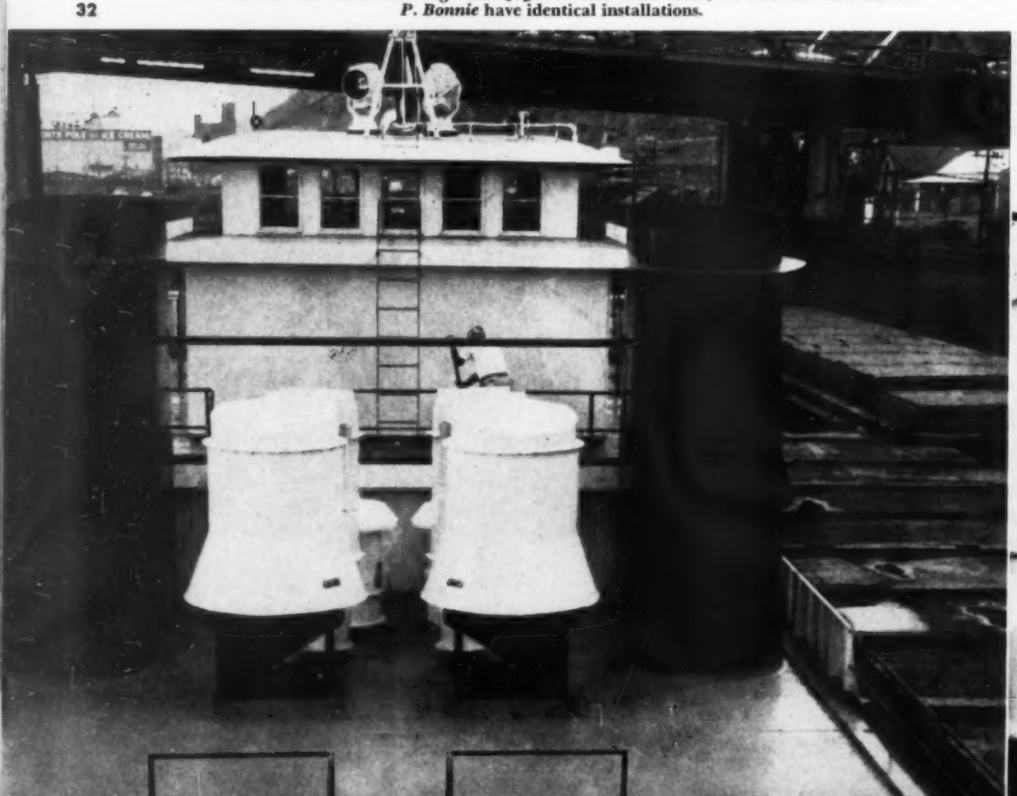
CLEANER AIR ON THE WATERWAYS

By **BRUCE W. WADMAN**

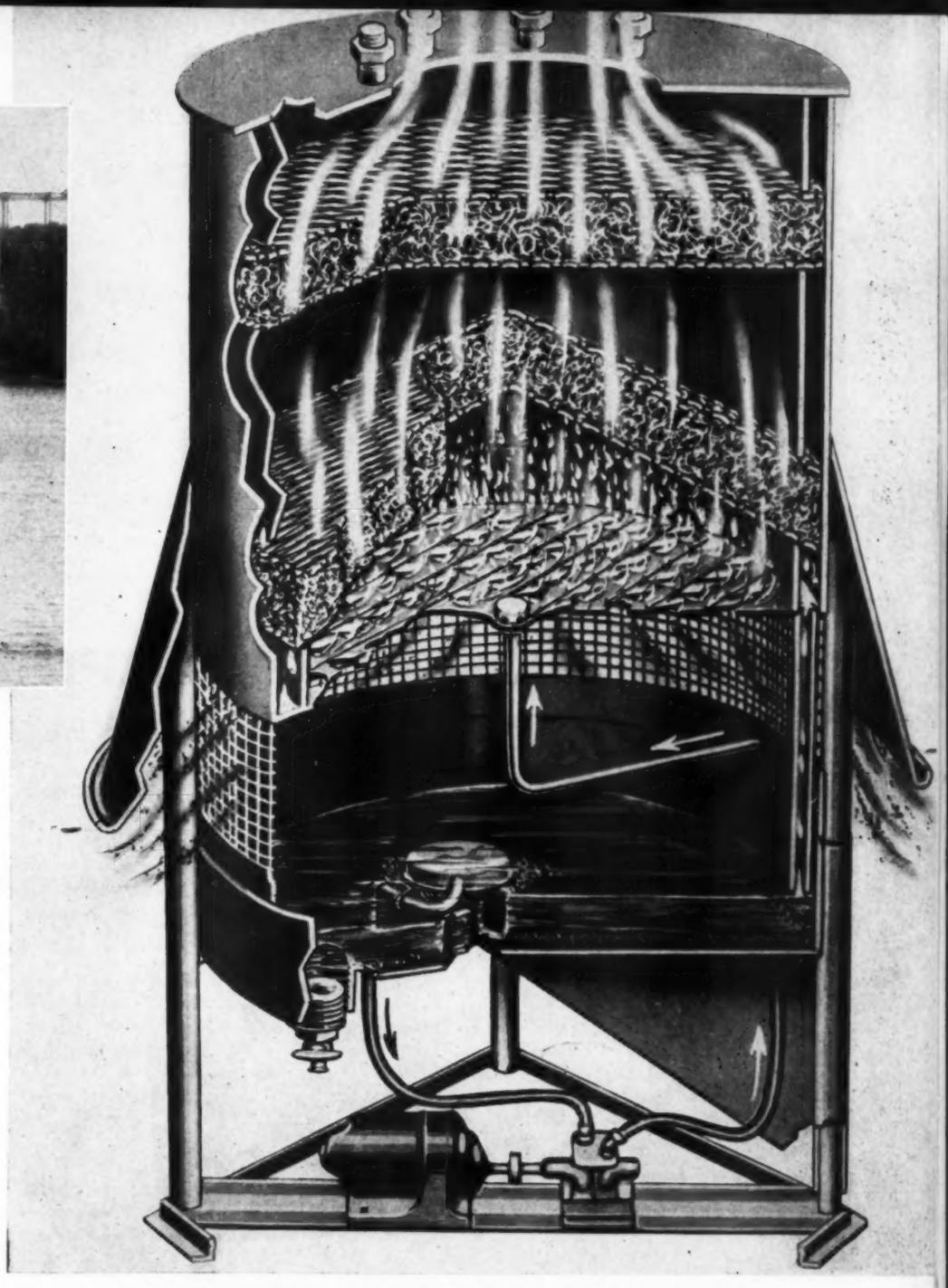
THE rivermen who have watched the American Barge Line towboats *Jeffboat, Advance,* and the *Robert P. Bonnie* at work on the inland waterways during the past year have probably wondered as to the purpose of the two strange structures setting on the after decks of the towboats. They looked like two extra stacks with a tube coming out of the top and going back down through the deck. If you were to tell a rivermen that these are oil bath air filters for the engine intake air, he probably would be quite surprised. Also, he might tell you that these air filters were quite an extravagance because towboats operate on the open water of the waterways where the air is clean and there is little need for an air filter.

A few years ago the American Barge Line, in studying the problem of excessive engine wear throughout the fleet, decided to investigate the possibility of unfiltered air being the cause of this wear condition. They analyzed their towboat operations and realized that one source of air contamination came from bulk cargoes such as sulfur and coal in the tow. Another source came from the air in and around terminal areas like Pittsburgh and other industrial centers where the air is full of abrasive particles. Because these towboats were operating

Location of the two "cycoil" oil bath air filters is shown here between the stacks on the after deck of the American Barge Line *Jeffboat*. Her sister boats, the *Advance* and *Robert P. Bonnie* have identical installations.



Closeup view of one of the Model PV American Air Filter units on the *Jeffboat,* equipped with vari-flow valves.



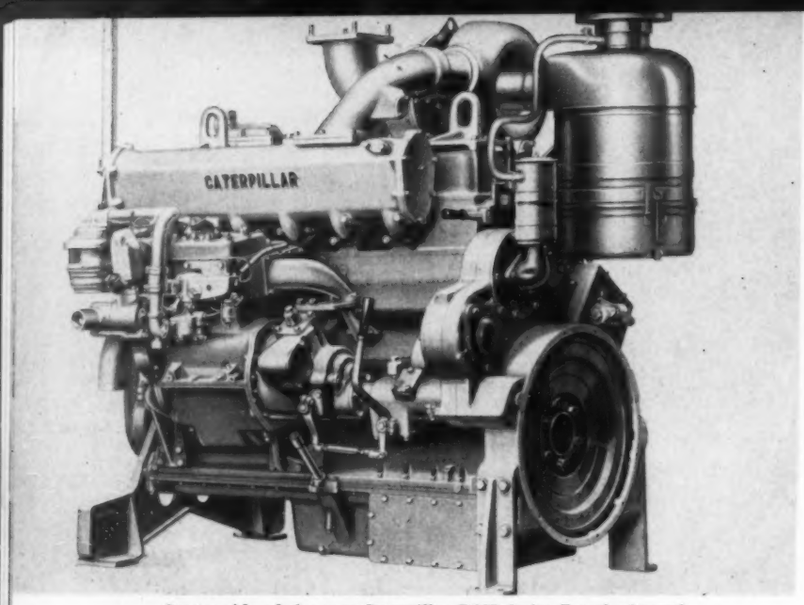
Cutaway view indicates cleansing process given dirty intake air. Oil is entrained in the dust-laden air by means of a perforated plated across the air stream. Oil flows over it from a central distributing head. The metered orifices in the plate are calibrated to increase the velocity of air flow. Thus oil that tends to spill over the edges is entrained and at the same time uniform flow is maintained over the filter area. The air leaving the perforated plate with its oil and dust content passes upward into a conical-shaped filter, so designed to accelerate the migration of the collected oil droplets to the perimeter, which is out of the air stream. This washing action keeps the filter clean and the dirty oil that collects in the annular chamber flows back to the reservoir in the bottom of the filter. There the dust and grit settles out as sludge. A secondary filter is provided to remove any oil mist that might have escaped entrapment in the cone. The reservoir is hinged so it can be swung clear of the casing for ease in removing sludge and replacing oil. A small motor-driven oil circulator supplies a constant flow of oil over the plates.

under very severe dirty air conditions much of the time, it was felt that an improvement could be made in the quality of the air being supplied to the engines. Since the *Jeffboat, Advance,* and the *Robert P. Bonnie* were the three largest towboats, in terms of power, operated by this company, they were selected for installations of air-cleaning equipment. (See DIESEL PROGRESS for February 1954 for a complete article on the *Jeffboat.*) Each of these boats is powered by two Fairbanks-Morse 10-cylinder 1600 hp opposed-piston diesels. The *Bonnie* and the *Advance* were equipped with panel-type air filters. While this type filter bettered the condition, the operators believed that further improvements could be attained. Thus, all three vessels were subsequently equipped with American Air Filter type PV "cycoil" oil bath air filters which have been in service just over a year.

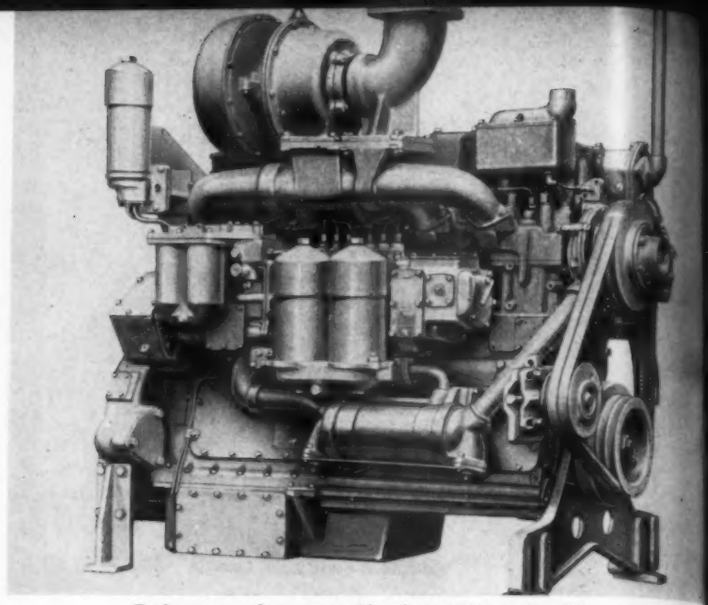
The oil bath air filters were selected to replace the panel-type because of their higher continuous efficiency and dirt holding capacity, and because they are much easier to maintain. The panel-type filters must be serviced and cleaned often and are subject to the human element of neglect more than the oil bath type, which only has to be cleaned occasionally. Another important factor in the installation of the "cycoils" is that they are fitted with vari-flow valves on the perforated entrainment plate. These hinged valves covering the openings in the plate are actuated by the air flow and maintain a constant ratio of orifice opening to air velocity. The result is positive oil entrainment and sustained high cleaning efficiency from as low as 10% of rating to full capacity. This is an extremely important and essenital feature for towboat operations, particularly in cycling and maneuvering through locks where repeated starts and stops and maneuvering cause frequent and abrupt changes in engine load conditions.

At this writing, the engines have not been taken down for overhaul since the oil bath air filters were installed. Therefore, there has been no opportunity for measuring wear. Nevertheless, improvement has been noticed in the clean general appearance of the engines, particularly in the plenum chamber in the blower, and in the air box, especially in corners and near struts. American Barge Line officials believe that the installation of the oil bath air filters has improved their situation greatly and is the solution to their problem of excessive engine wear.

This application of highly effective air filtration to inland waterways vessels is extremely significant because: 1. Outside air conditions in many aspects of towboat operations are very dirty and full of harmful abrasive particles. 2. In the future, many new engines installed in towboats will be turbocharged, with accompanying air demands, and it will be essential for efficient and productive operation to keep the intake air clean.



Starter side of the new Caterpillar D337 Series F turbocharged diesel. It is rated 300 hp at 1800 rpm. Designed for the Cat DW20 and DW21 wheel-type tractors, it also will be offered for industrial, marine and electric generating service.



Fuel pump and governor side of the D337 engine. The turbocharger has its own lube oil filter, shown in extreme upper left. The engine has six cylinders, piston displacement of 805 cu. in., bore and stroke of 5⅛ and 6½ inches.

TURBOCHARGED CATERPILLAR ENGINES

TWO new diesel engines, featuring increased horsepower through turbocharging, have been added to its line by the Caterpillar Tractor Co. The new turbocharged 300-hp Cat D337 (Series F) diesel is now under the hoods of the company's DW20 and DW21 wheel-type tractors. Piston displacement on the six-cylinder D337 is 805 cu. in. with 5⅛-in. bore and 6½-in. stroke. Its speed is 1800 rpm. It will also be available in industrial and marine engines and diesel electric sets.

The second turbocharged Caterpillar was designed specifically for use in the D9 and at present is being built solely as a power plant for this giant crawler. This 286-hp turbocharged D353 engine is called the world's most powerful crawler tractor engine by Caterpillar. Also a 6-cylinder engine, it operates at 1200 rpm, has a displacement of 1473 cu. in. with bore and stroke of 6¼ and 8 in.

A number of new design features have been incorporated into the D337. Piston rings ride freely with minimum wear because the cylinder liners are honed and chemically treated. These "Hi-Electro" hardened liners are of full length, wet-type design that makes them easily cooled. The pistons are balanced within close tolerances. Cast iron bands support the top rings to give extra strength to the aluminum alloy pistons. All rings are chrome-faced for better lubrication and added wearing qualities. Seven large aluminum alloy bearings support the crankshaft. A thin coating of tin on each bearing assures proper break-in.

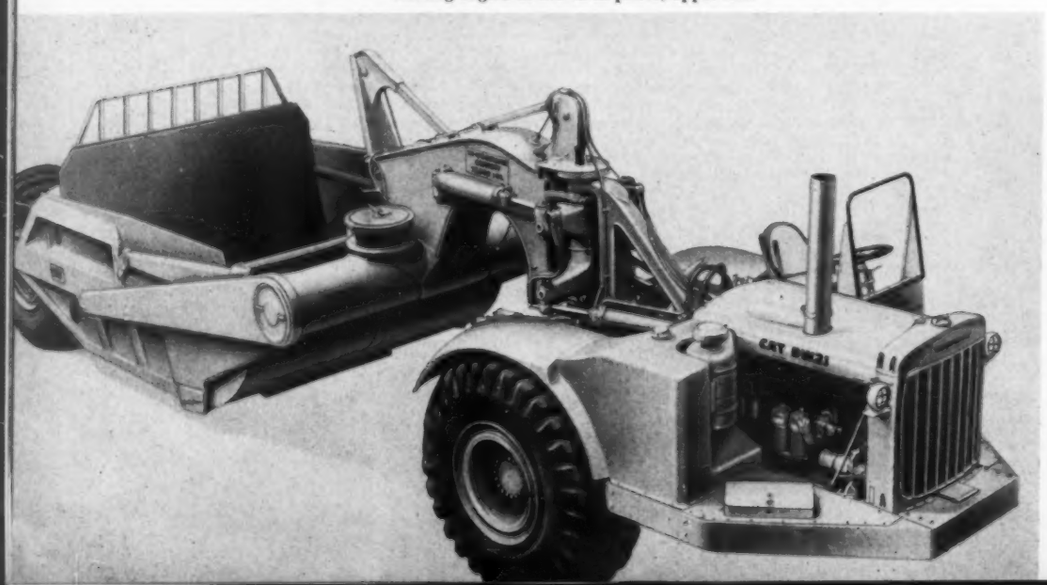
Many valve train features—such as dual valve springs, large, alloy steel valves, replaceable valve seats and guides, hardened cam followers and durable valve rotators—have been incorporated into the D337. To these have been added hydraulic valve lifters which automatically maintain proper valve adjustment.

The D337 utilizes the conventional Cat fuel system with identical component parts for every cylinder. Replacement of any particular component part, like injection pump, injection valve or pre-combustion chamber, is done without adjustments. For example, the "capsule-type" injection valves are individually replaceable without balancing. These valves contain a large, single orifice which resists carbon deposits that hamper efficiency of fuel injection. The D337 can burn a wide variety of fuel, including No. 2 commercial furnace oil. The pre-combustion chambers atomize the fuel before the fuel charge enters the cylinders. This fuel preconditioning allows the engine to burn the non-premium diesel fuels with maximum performance. Paper-type filter elements protect the fuel injection equipment.

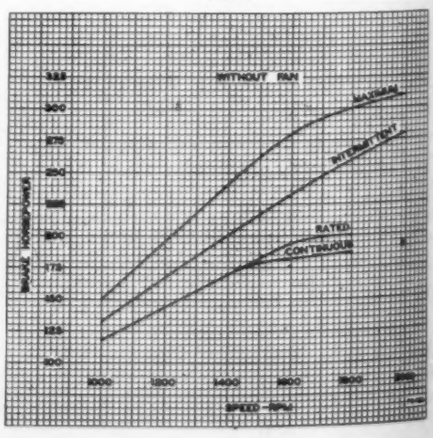
The D337 pump has been mounted inside the engine oil pan. A large access plate in the oil pan permits easy inspection without dropping the pan. Plastic impregnated filter elements are provided to filter all oil each time it circulates.

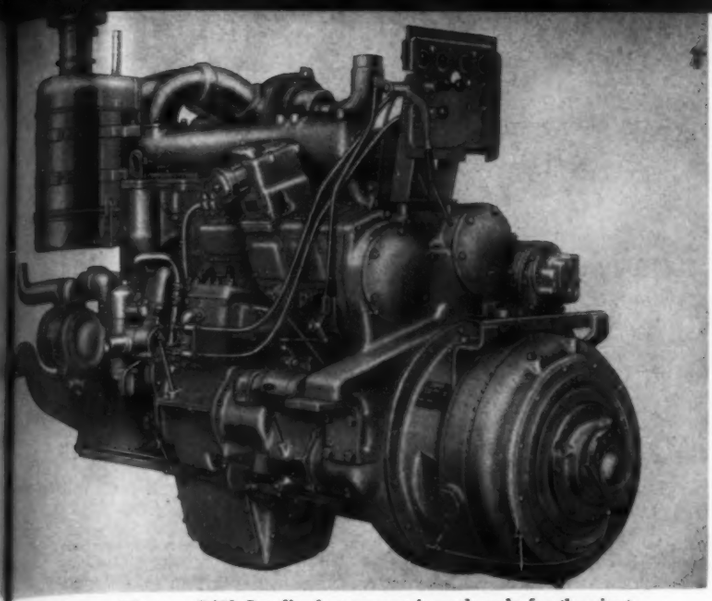
Oil spray jets, located just below the cylinder liners, spray oil on the underside of the pistons.

The DW21 two-wheel tractor and scraper is powered by the turbocharged D337 Cat diesel. The 300-hp engine provides speeds up to 20.5 mph in fifth gear. Heaped capacity of the scraper is 25 cu. yds. Buyers have an option of direct electric diesel starting or a gasoline starting engine as shown in photo, upper left.

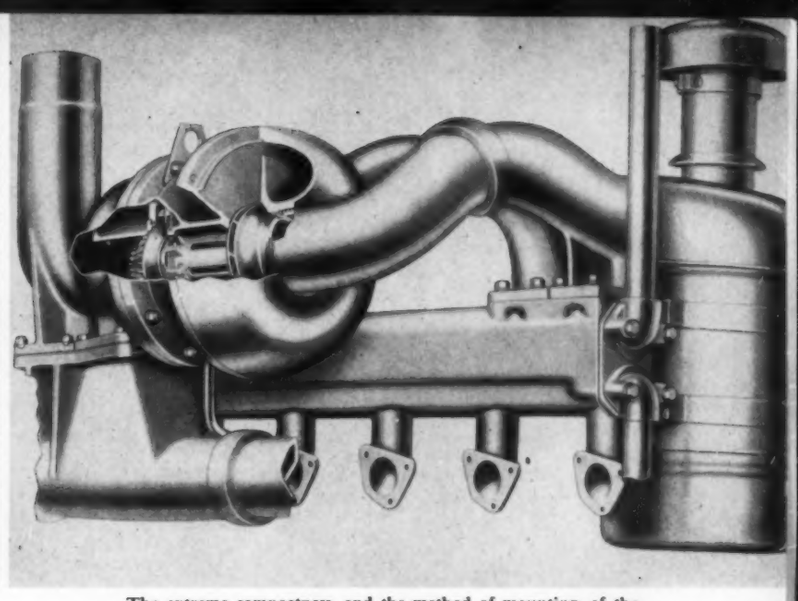


Ratings shown on the two graphs are corrected to sea level barometric pressure and 60°F temperature and apply to production engines including air cleaner; water, lube and fuel pumps; and standard intake and exhaust manifolds.





The new D353 Cat diesel at present is made only for the giant D9 crawler tractor. As shown above, it is offered with a Twin Disc 3-stage torque converter and a newly-designed turbocharger. It delivers 286 hp at 1200 rpm; has a displacement of 1473 cu. in. with bore and stroke of 6½ x 8 in.



The extreme compactness, and the method of mounting, of the AiResearch turbocharger as designed for Caterpillar engines is shown in the above partially cutaway view. The turbine housing's inlet serves as the turbocharger's base for rigid attachment to the exhaust manifold.

Besides lubricating piston pins and cylinder walls, this spray of oil cools the pistons. The D337 is equipped with a lube oil cooler.

Self-adjusting seals provide an adjustment-free water pump. This gear-driven pump has ample capacity to maintain the proper engine temperature for most efficient operation. Its impeller mounts on a rust and corrosion-resistant, stainless steel shaft which in turn is mounted in anti-friction ball bearings. Dynamic balancing affords smooth operation. D337s are equipped with water manifolds which help control coolant flow throughout the engines. To aid the water manifolds in their tasks, strategically located water directors further direct coolant to the high heat areas.

The newly developed turbocharger on the D337 adds horsepower at reduced fuel costs per horsepower. It was designed jointly by engineers at AiResearch Industrial Division of the Garrett Corp. and Caterpillar and is manufactured by Garrett. (See DIESEL PROGRESS, May, 1955, pages 60-61.) It is driven entirely by exhaust gases and packs air into the engine according to engine load, not speed. When the engine lugs down under load, the air supply actually increases enabling the engine to convert more fuel to horsepower. "Through breathing" has also been incorporated with exhaust and intake manifolds located on opposite sides.

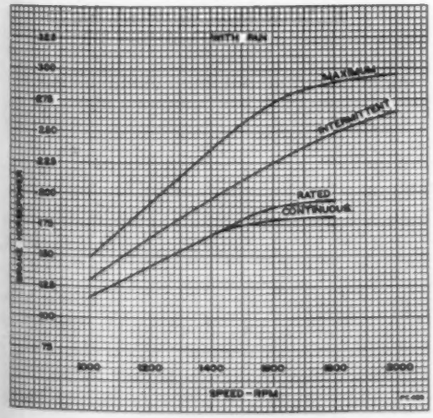
High-strength cylinder heads, cast in Caterpillar's own foundry, of a copper-molybdenum alloy iron absorb the heat and pressure of heavy loads. Built-in water directors and large water passages assure uniform cylinder head temperatures.

The D353 timing gears are driven from a "Hi-Electro" hardened gear at the rear end of the crankshaft. This location provides a convenient place for mounting tractor and engine accessory drives. In addition, it minimizes the effects of torsional amplitudes in the accessory drive shafts. The timing gear housing can be removed without disturbing either the crankshaft or the oil pump drive. The D353 cylinder block is heavily ribbed for strength and features large crankcase access doors. "Hi-Electro" hardened caustic etched cylinder liners and full-length water jackets are also features. A high camshaft mounting permits the use of a short, rigid valve train. Maintenance-free design has been obtained by making most oil and water lines integral with the cylinder block and head. The short-rigid valve train was designed for high performance. The D353 camshaft is located high in the cylinder block to permit use of the short valve train. Flexibility of valve train parts is minimized, hardened steel valve seat inserts and positive valve rotators help increase valve life.

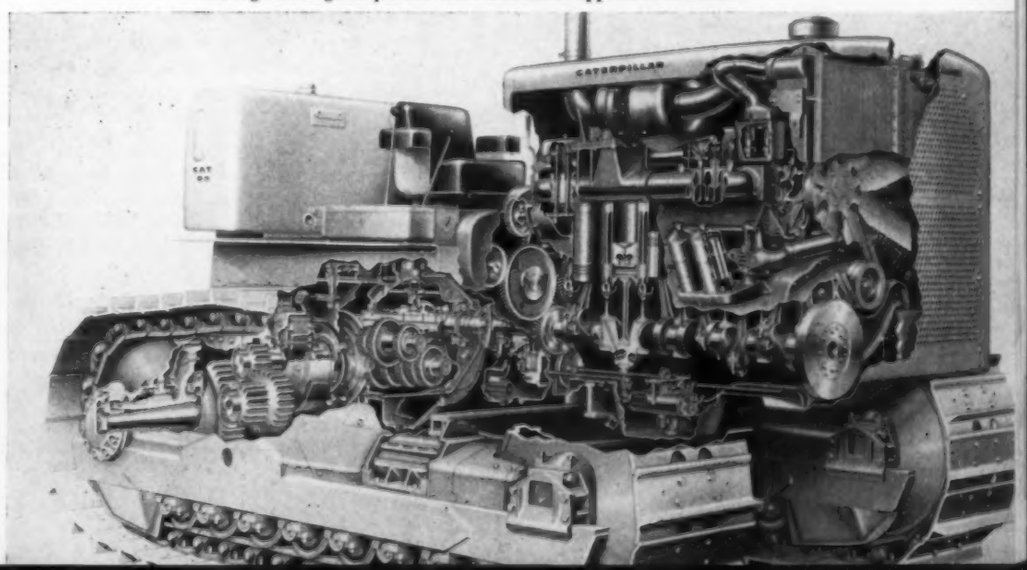
A sensitive governor automatically matches the amount of fuel injected to the loads imposed on the engine. Capsule-type fuel injection valve and pre-combustion chamber design permit use of low-cost fuels. A large capacity three-unit oil pump assures a constant flow of oil to vital moving parts. New design has made it possible to use drilled holes in the cylinder block and head as oil passages in many cases. A full-flow filtration system removes harmful particles by the use of plastic impregnated filter elements.

A high-capacity water pump is driven by a shaft running from the timing gear train at the rear of the engine and provides 150 gallons of cooling water per minute. "Cross-flow" radiator was designed to make use of maximum cooling area. This system includes a large expansion tank which helps keep a positive head on the pump at all times.

In these curves, "rated output is for applications where the average duration of sustained full load is 12 hours or less a day. "Continuous output" applies to cases where sustained full load is 24 hours a day, day in and day out. Both curves apply to the D337 engine.



The cross-sectional illustration below is of the D9 tractor with the turbocharged D353 diesel engine which transmits power either through a standard Cat mechanical clutch or through a 3-stage torque converter. The clutch appears in this unit.



AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY MERRILL C. HORINE

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

DRY-TYPE CLEANERS

Turbocharging Accelerates Return To Dry-Type Air Cleaners

AIR cleaners seem on the way to return to first principles. The first of these essential devices were of the dry type, consisting of radially convoluted filtering media, such as shaker flannel or kraft paper, or centrifugal spinners. The latter type is still in considerable use today as pre-cleaners in series with oil-bath, oil-wetted or dry air cleaners.

The dry-type, until recently, had all but disappeared from automotive usage. Today it is staging a strong come-back and its more enthusiastic proponents predict that it will largely replace the oil-bath type, for diesel-driven vehicles, just as the latter has virtually ousted the oil-wetted type.

Diesels have been the bell-wethers in this trend, which has been accelerated by the rising popularity of superchargers. The principal reason for growing dissatisfaction with oil-bath types is the numerous cases in which high manifold suction has resulted in pull-over of air-cleaner oil into the engine. Such pull-over, of course, is apt to produce extreme knock, due to pre-ignition, heavy smoking, and, until the air-cleaner oil is exhausted, runaway operation. In addition the oil so introduced into the engine is likely to be heavily dirt-laden.

Proponents of the oil-bath cleaner point out that such pull-over can be prevented by the selection of a size sufficient to reduce the air speed through the cleaner below that at which the vacuum in the cleaner is excessive. They also state that if the cleaner is mounted low enough, sufficient head against the oil will be provided to prevent pull-over. In stationary and marine applications, such larger cleaners may readily be accommodated; but with space and weight at such a premium as they are in vehicles, the size of the cleaner is necessarily restricted considerably.

Present dry-type cleaners bear little resemblance to their pioneer predecessors in detail design and they greatly exceed them in dirt-removing ability and capacity. They offer no greater restriction to air flow than the oil types, and, for the same capacity, are both lighter and more compact. Servicing, too, is easier, requiring only the removal and discarding of the dry cartridge, replacing it with a new one. One drawback is that the cost of cartridge renewals may exceed that of oil renewals in the wet type; but this is partially compensated by the saving in labor involved and the kerosene used in washing out the sump of the latter.

Another advantage which the dry-type seems to offer is the fact that after sufficient dirt has collected on the cartridge to require its replacement, it exerts a throttling effect which cuts down on the engine's power, while continuing to filter out foreign matter. The consequent drastic deterioration of performance will surely prompt timely attention before damage is done to the engine. Neglect of the oil-bath type, it is claimed, causes a progressive loss of cleaning effectiveness without affecting engine performance; thus exacting a toll in increased engine wear.

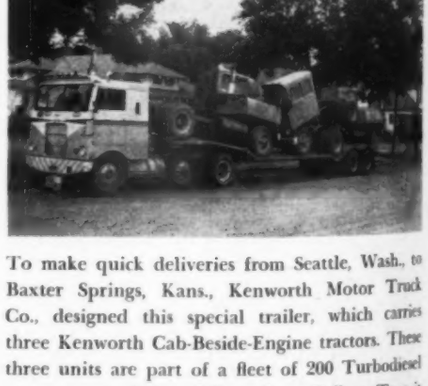
COMMENT ON EXHAUST RETARDER

Commenting on the October installment of this series on the subject of Exhaust Retarders, Prof. W. E. Meyer, of Pennsylvania State University, takes issue with the statement that such devices are not applicable to gasoline engines. He states that by the addition of a fresh-air valve in the intake manifold, the carbureter may be by-passed and the evils cited avoided.

The author acknowledges that this is true; but desires to point out that devices of this type whose operation he has observed, left much to be desired. On acceleration, after the use of the exhaust retarder, the intake manifold and valve ports were dried out and cooled to an extent that the engine responded sluggishly to the throttle, with considerable popping back into the carburetor.

Prof. Meyer also asserts that the increase in retardation over the unaided engine is likely to be greater than the 50% cited by the author; predicting as much as 100% gain over the unassisted engine. Encouraging as this is, the author questions the latter estimate. The total engine retardation is made up of mechanical friction, accessory horsepower absorption and vacuum, as well as air compression. The first two would not be increased by exhaust restriction and the latter, in the case of a gasoline engine, would be reduced.

Special Trailer



To make quick deliveries from Seattle, Wash., to Baxter Springs, Kans., Kenworth Motor Truck Co., designed this special trailer, which carries three Kenworth Cab-Beside-Engine tractors. These three units are part of a fleet of 200 Turbodiesel tractors now being delivered to Yellow Transit Freight Lines, Inc. The Kenworths are powered by the new 175-hp Model JT-6-B Cummins Turbodiesel and are replacing 250 gasoline-powered tractors on Yellow Transit's network of 8435 miles.

ARBA Convention

Plans for the 1957 American Road Builders' Association Annual Convention and International Road Show are developing fast. Preliminary arrangements for the show, which will exhibit all types of heavy construction machinery, were worked out by representatives of ARBA and CIMA (Construction Industry Manufacturers Association) in September.

A spectacular indoor exhibition will draw tremendous throngs to the enlarged Chicago Amphitheater from Jan. 26 to Feb. 3, 1957. Space exceeding 300,000 sq. ft. will be devoted to the equipment display. Delegates from every state and from most foreign countries, representing all branches of government and industry, will participate in the brilliant Convention program to be offered by ARBA and in the special activities of the Road Show.

A full scale informational program on the Road Show will get under way in the early months of 1957. The special liaison CIMA committee, to coordinate the Road Show program, is headed by Harvey A. Scribner of the Russell T. Gray, Inc. advertising firm in Chicago. Serving with him will be J. E. McCracken, Bethlehem Steel Co. and Donald O. White, American Asphalt Paving Co., both representing ARBA. In addition, the liaison committee will include C. E. Stevens, International Harvester Co., representing the International Road Federation, and Paul B. Reinhold, Atlas Equipment Corp., representing the Associated Equipment Distributors.

A special CIMA working committee for the Road Show includes: A. W. Lehman of Richard T. Brandt, Inc., and H. K. Kenyon of the Andrews Agency, representing advertising agencies.

Advertising managers on the committee include: Don Fricker, The Heil Co.; M. B. Jaeger, Bucyrus-Erie Co.; Lloyd Rager, Le Tourneau-Westinghouse; J. M. Gates, The Galion Iron Works & Mfg. Co.; and W. A. Rundquist, Pioneer Engineering Works.

ARBA's representatives on the CIMA Working Committee will include Burton F. Miller, deputy executive vice president and R. L. Smith, director of public relations.

Ex officio members named to the committee are Kenneth Lindsay, executive vice president, Iowa Manufacturing Co., president of CIMA; Julien R. Steelman, president of The Koehring Co. and chairman, Joint ARBA-CIMA Show Committee; and Harold F. Hess, executive vice president of CIMA.

Ampco-Sinclair Engine Starter

The Ampco-Sinclair engine starter, now being marketed, is said to be designed for application on all diesel and gasoline engines of up to 1000 cu. in. displacement. The new unit will meter an adequate amount of starter fluid into an engine automatically to provide quick starting at temperatures as low as −40°F. It represents the result of 6 years development work at the Sinclair Research Laboratories in Harvey, Illinois.

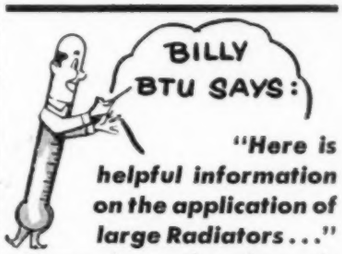
The Ampco-Sinclair unit is available for permanent or portable application. The portable kit permits a single operator, through the use of quick coupler installations, to work on several engines with a fleet and represents the most economical method. The starter is ruggedly constructed with controls which permit use with gloved hands.

Full information is obtainable from Sinclair Refining Company, Technical Service Division, 600 Fifth Ave., New York 20, N. Y. or from Automotive and Marine Products Corp., 87 Harvard Ave., Boston 34, Mass.

Young Heat Transfer News

YOUNG RADIATOR COMPANY, RACINE, WIS.

Ford Dissipates Quench Oil Heat with Young Evaporative Coolers



"Here is helpful information on the application of large Radiators . . ."

There are in general use, four methods of cooling a large internal combustion engine with a Radiator.

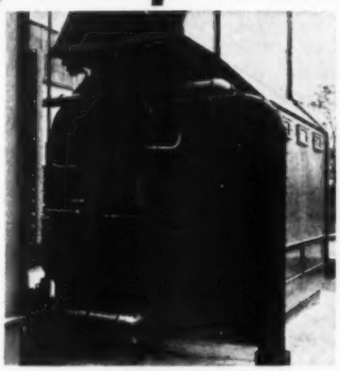
The most common method is to use a single stream of water through a Radiator.

The second most common method is to use a portion of the Radiator to cool the lubricating oil directly.

The third most common method of temperature control is to use two separate streams of water each through a separate portion of the Radiator. One stream is engine jacket water, and the other is used through a shell and tube lubricating Oil Cooler.

The fourth method of cooling is used where one large Radiator must cool several engines of various makes or models. This method consists of cooling a single stream of water through the Radiator to a rather low temperature and passing this water through several shell and tube Coolers to cool the lube oil and jacket water for each engine in separate Coolers.

For further details, see Booklet offer below, or contact Young Radiator Company, Department M-405, Racine, Wis.



Heating element wrapped around oil lines serving YEC.

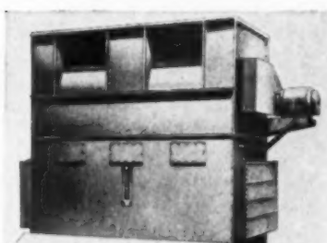
Rear view shows convenient observation ports.

Transmission Plant's Heat Treat Operation Completely Automatic

Ford Motor Company's transmission plant, Livonia, Michigan, is equipped with two Young Radiator Company Evaporative type Coolers. Set up for completely automatic operation, the Young Coolers reject quench oil heat in the heat treating department. Because the cooling units are installed out-of-doors, oil lines are wrapped with heating elements and water lines are fitted with steam jets to prevent freezing in winter.

Young Evaporative Cooler moisture eliminators separate entrained water from the vapors and return water to the Cooler pumps. Thus, only vaporized water is lost by discharge in the air stream.

Versatile YEC Units meet a variety of cooling and condensing problems. By varying the basic design slightly, economical standard units can be adapted to cool engine jacket water, lubricating oil, natural gas, and condense steam, hydrocarbons and other gases . . . at operating pressures ranging from 100 to 2000 psig. For further details write for free Catalog No. 1952 to Department M-405, Young Radiator Company, Racine, Wisconsin.



Rear view showing several access panels in all sections.

RADIATORS FOR STATIONARY ENGINES BOOKLET AVAILABLE FOR DESIGN ENGINEERS

A 16-page Booklet prepared by a leading Young Radiator Company design engineer discusses four methods of cooling internal combustion engines with a Radiator. Material includes schematic drawings, pictures and sample specifications. Price, 50¢. Write for Bulletin 2136 to: Young Radiator Company, Racine, Wisconsin.

Young RADIATOR COMPANY

RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.

Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

NEW ALLIS-CHALMERS EQUIPMENT

By DOUGLAS SHEARING

ALLIS-CHALMERS is aggressively pursuing its policy of bringing forth new and improved diesel-driven units to meet the demands of earthmoving and construction contractors. Of major interest among several recent announcements is the new hydraulically operated bottom-dump motor wagon, the TW-360. It is powered by a 280-hp A-C diesel, turning at 2100 rpm. Speeds forward range from three mph in first gear to 20 mph in fourth. Reverse speed is 3.1 mph.

The new motor wagon tips the scales at 47,000 lbs., has a 22-ft. wheel base; and has a struck capacity of 17 cu. yds., or 26 tons, with heaped loads of 22 cu. yds. Its overall length is 35 ft. 10½ in., width, 11 ft. 3¾ in., and height 10 ft. 1½ in. When loaded, the TW-360 has a front axle clearance of 22¼ in. Loaded, the hopper clearance is 29½ in.

The TW-360 is a companion unit to the TS-360 scraper, previously announced, insofar as power and capacity are concerned. A new booklet, MS-663, describing the latter, is out which may be obtained from the Construction Machinery Division of Allis-Chalmers in Milwaukee. An even newer 8-page booklet, MC-180, gives full specifications for the HD-11G tractor shovel which has 2¼-yd. capacity and 105 net engine hp.

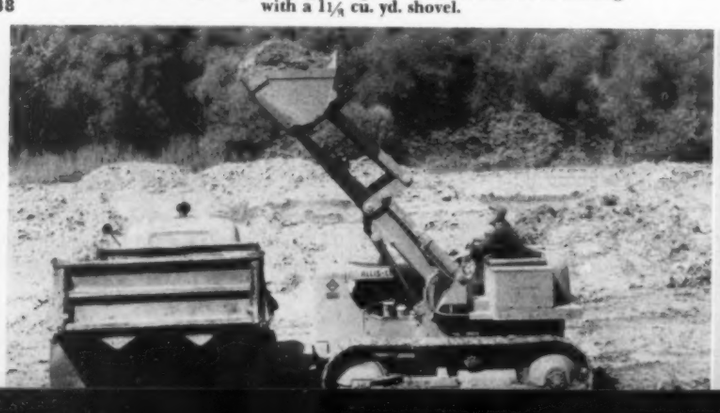
Other recent additions to the Allis-Chalmers line are the HD-6 crawler tractor, and the HD-6G and HD-11G tractor shovels. Officials say that these units were "introduced in line with the company's engineering development and production policy to provide equipment of the highest performance and dependability."

Many features found in other crawler tractor models recently placed on the market by A-C, including the HD-21 and HD-16 are incorporated in these smaller units. Power in the HD-6s is provided by the A-C HD-344 diesel, a 4-cylinder, 4-cycle engine that develops 57 net flywheel hp—45 hp at the drawbar. Maximum drawbar pull is approximately 12,650 lbs.

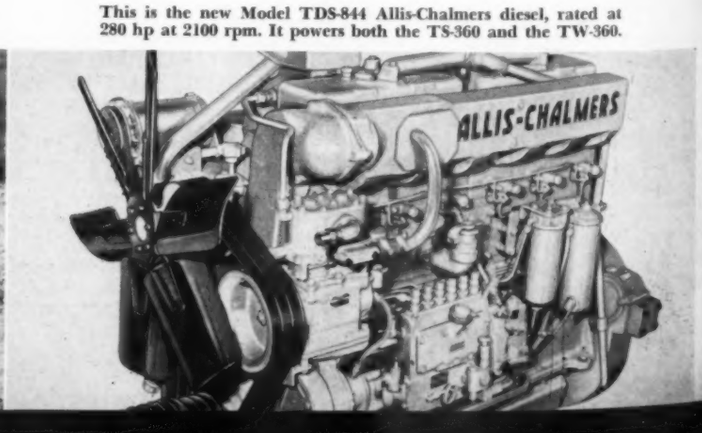
The tractors feature the "wrap-around" radiator guard that is said to provide better tractor balance and to reduce tractor-dozer combination costs. The announcement says that "ease of operation, visibility, and other operator comforts incorporated into the tractors includes foam rubber seats and arm rests, covered with weather-resistant plastic. Interchangeable equipment for the HD-6G includes rock, drag and light materials buckets; an angledozer and two bulldozer blades; crane hook; trench hoe; lift, tine, and rock forks."

***Top*—One of the new 280-hp Allis-Chalmers TS-360 motor scrapers dumping on a fill on the Indiana Turnpike. *Above*—The newest A-C unit, the TW-360 bottom-dump motor wagon. Also 280 hp, its struck capacity is 17 cu. yds., heaped, 22 cu. yds.**

The new Allis-Chalmers HD-6G tractor shovel is powered by the new A-C engine providing 45 hp at the drawbar. It is loading with a 1¼ cu. yd. shovel.



This is the new Model TDS-844 Allis-Chalmers diesel, rated at 280 hp at 2100 rpm. It powers both the TS-360 and the TW-360.



Book Review

"Diesel Operator's Guide" by C. Morgan Jones. 389 pages. Illustrated. McGraw-Hill. $6.50. November 1955 Publication.

To meet the needs of the vast and ever-growing number of diesel engine users, a practical guide to quick and efficient maintenance and operation of all such types of engines is now made available. Engines used in automotive, stationary, and marine installations are covered. Basically, the book tells how to recognize engine trouble, symptoms, how to diagnose their cause, how to remedy the defect, and how to prevent its recurring.

Diesel Operator's Guide covers those practical facts of immediate interest to power-station engineers, marine engineers, truck-fleet operators, garage mechanics, and operators and maintenance men wherever diesel engines are used. It tells him quickly how to go about doing any particular job from timing a fuel pump to planning a cooling water system. The book is designed to keep engines working on the line, and to cut operating costs occurring through needless stoppages or faulty maintenance procedures.

Latest diesel engine developments are covered. They include such topics as the dual-fuel and heavy-fuel engines, intercooling, after-cooling, and supercharging. In addition, the book also includes chapters on newest types of fuel pumps and how to maintain them, engine governors, intake and exhaust systems, engine drives, and engine foundations. The book also contains information on fuel storage and engine maintenance schedules.

Engine Sales Reported

The following recent sales have been reported by Cummins Diesel of New England, Inc., Allston, Mass.: a 110-hp Model HRGA-401 to Tobey Hospital, Wareham, Mass., to turn an Electric Machinery generator for auxiliary power; a 165-hp Model HRM-600 to Giagio DeGiralama, Boston, to repower the fishing boat, *San Antonio II*.

Orders Diesel-Electric Tug

William J. Tracy, president of the Tracy Towing Line, Inc., New York City, placed an order with Cleveland Diesel Engine Division of General Motors for a new 105-ft., 1350 shaft horsepower diesel-electric drive tug. It will be built at the Levingston Shipyard at Orange, Texas, and will be delivered in April, 1956. This new tug will be a sister tug to the *Helen L. Tracy* which was built in 1953. Other GM powered tugs in the Tracy Fleet are *Thomas Tracy* and *William Tracy*.

Joins Chromium Corp.

Fay Thomas is now associated with the Chromium Corporation of America as manager of Railroad Sales for the Cleveland Plant. On September 1, 1955 he joined the staff of the corporation at Cleveland, Ohio. He was formerly general superintendent of diesel and electrics for the New York Central System and brings a well-rounded experience in locomotive maintenance to the customers of the Chromium Corporation. He has served in a succession of mechanical positions for 35 years with the New York Central and was instrumental in the development of the Collinwood shops as a center for diesel maintenance and engine overhaul.

Mr. Thomas primarily will work toward the development and expansion of chromium plating activities within the railroad industry, however, his services as a consultant in all phases of preventive maintenance programs will be available.

Random Thoughts from a Filter Engineer

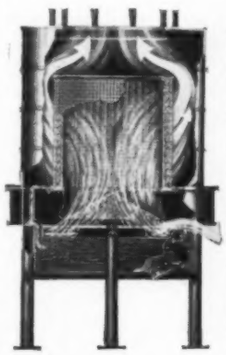
by George Slater

- NEW LOW PRESSURE DROP FOR OIL BATH FILTERS
- IMPROVING ON A "DOG-HOUSE" FILTER
- THE MOST COMMON FILTER DISEASE

NEW LOW PRESSURE DROP FOR OIL BATH FILTERS

In most cases it's desirable to keep an air filter's static pressure loss as low as possible. This is easy to do in a panel or rotating curtain type filter. But until recently it wasn't easy in an oil bath filter unless you used outside pumps or gadgets.

In fact, we believe there's only one filter on the market that, without extra help, provides high efficiency, large dirt holding capacity *and* low pressure drop. That's our LPD design. LPD stands for *L*owest *P*ressure *D*rop. This low pressure drop is accomplished by a design that's radically different from our standard line of oil bath filters. LPD filters were specifically made for a larger range of air flows at resistances as low as 1 inch of water.

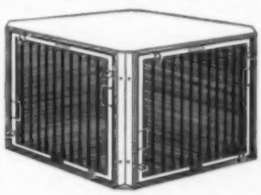


This design improvement has been the result of many years of experience and development. And we're rather proud of it. Of course, LPD oil bath filters do not replace our other line of oil bath filters. They are not made in the smaller sizes because we still have not been able to build the needed flexibility into them. But LPD filters are a step forward in the art of filtration. They are particularly applicable to turbo-charged engines where intake air pressure losses are critical.

IMPROVING ON A "DOG-HOUSE" FILTER

Many filter users require air filter panels held in place in their own plenum chamber. We call these "DH filters"—DH for dog-house—because the plenum chamber, from the outside, looks like a "dog-house". This "dog-house" design has two chief advantages: extremely low pressure loss and very low initial cost. Servicing is easy, too. Generally, spare panel cells are purchased so that dirty filters can be quickly replaced by clean ones and the dirty ones cleaned at any convenient time.

Servicing presented an unusual hazard. In removing the dirty panels, the engine suction could draw in the serviceman's hat, scarf or other unwanted objects. We solved this problem by protecting the intake opening with a cylinder of expanded metal. This provides large enough openings so that air flow is unimpeded but larger objects can't be drawn into the engine.



Of course, this is only a minor advantage. But it's another example of the little extras we build into every Air-Maze product. Taken separately, these extras are not too important. But when you put them all together, they add up to big performance and maintenance savings.

THE MOST COMMON FILTER DISEASE

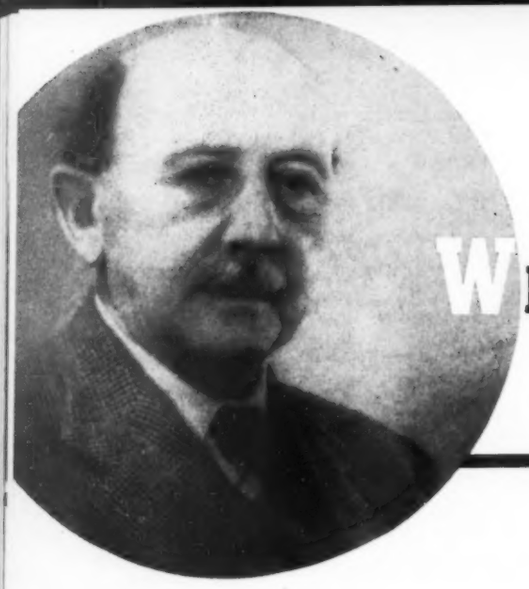
It's unfortunate that the full efficiency and protection built into a filter can't be realized unless the user cooperates. No matter how successful the filter manufacturer is at extending the servicing period, there still comes a time when some service is necessary. Improper maintenance is the most common disease filters suffer from.

We've tried to analyze why filters aren't treated better. And we think part of the answer lies in the fact that people can't readily understand that filters will save money if kept clean. On a liquid filter, it's easy to see the connection between proper maintenance and reduced costs. Clean filters save on oil. And oil costs money. But with an air filter, it's different. Filter users don't have to buy air. They figure it's free. And they're not quick to realize that if filters aren't cleaned, dirty air gets through and that *does* cost them money.

We've always tried to make maintenance as easy as possible for the user. For example, we supply complete servicing recommendations with every Air-Maze filter. We feel that user and equipment manufacturer alike benefit by paying more attention to the inspection and treatment of filters. No filter in the world can do a good job unless it's properly maintained. The Air-Maze Corporation, 25000 Miles Ave., Cleveland 28, Ohio.

AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE
The Filter Engineers
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS



WHAT'S GOING ON IN ENGLAND

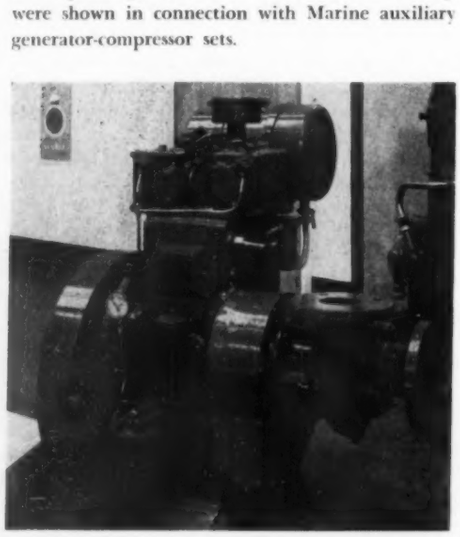
CONDUCTED BY **LEO WALTER**

Leo Walter was born in Vienna, Austria, and graduated in Mechanical and Electrical Engineering from the Vienna Technical University. He served his apprenticeship in a Czechoslovakian engineering works. Later he was project engineer during construction of power and heating plants. For six years, he was Chief Engineer for Central Europe for a well-known power plant contractor. He had established himself as an independent consultant before Nazism drove him to England in 1938. During the war years, he worked for several engineering firms, but now has his own consulting office in Cheltenham. His articles have appeared in numerous engineering magazines.

The 20th Engineering, Marine And Welding Exhibition

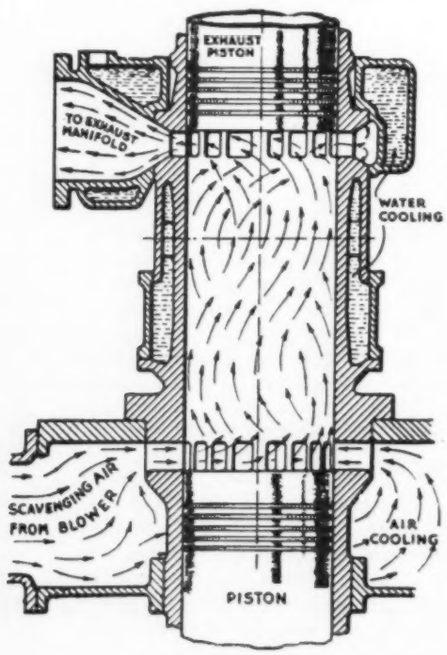
SOME 500 manufacturers exhibited their goods during September at the twentieth Engineering, Marine and Welding Exhibition at the Olympia Hall, London. The writer visited the exhibition in order to keep readers of DIESEL PROGRESS informed about new developments in diesel designs and marketing trends in Great Britain. Although nothing really revolutionary was exhibited, a few remarkable diesel types were shown for the first time.

Russell Newberry & Co. Ltd., Dagenham, exhibited their new "Husky" 1-cylinder 8-bhp engine. (Photo below) A 3-in. heavy-duty centrifugal pump is closely coupled to the high-speed shaft, capable of pumping 400 gpm. Designed mainly for irrigation duties, or for transport purposes, the gross weight with radiator is about 800 lbs. Also shown was the 8 bhp "Husky" diesel fire pump, using a Russell FV1 engine, running at 1500 rpm, and pumping 28½ tons of water per hour. The pump is self-priming. Diesel units of 65, 50 and 30 bhp were shown in connection with Marine auxiliary generator-compressor sets.



Messrs. Transport Equipment (Thornycroft) Ltd., London, showed their RJD/2 marine diesel engine. It has been added to the wide range of Thornycroft engines to meet the demand for a low-powered, compact, medium-weight diesel unit. The reversing gear is integral with the engine. The fixed reduction ratio is 2:1, and heavy-duty clutches are used. The two-cylinder engine has 3⅝ in. bore, 4⅛ in. stroke and a comparison ratio of 16.6:1. Maximum output is 16 shp at 1800 rpm. Four-stroke cycle with direct injection is used, and the engine has been approved by the British Ministry of Transport for use in passenger carrying craft and in life boats.

Harland & Wolff Ltd., Belfast, showed their H & W opposed-piston diesel engine Model 53 OS for industrial purposes. This type is of the cold-starting, airless injection, forced lubrication design, fitted with trunk pistons. The upper pistons are connected, on the latest H & W principle, to eccentrics on the crankshaft. (Drawing below)



Davey Paxman & Co. Ltd., Colchester, had on view the following engines: Vee-type 12-cylinder YLXM; 4-cylinder RPH engine with torque converter; 6-cylinder ZH horizontal; and 16-cylinder YHXL engine. The Paxman Series YL designs, available in sizes from 533 to 2000 bhp have been designed to meet railway requirements for direct coupling to a single-bearing traction-type generator. Types Y-X are pressure-charged at a compression ratio of 12.8:1.

The English Electric Co. Ltd., Rugby, exhibited an outstanding unit, — a 400-kw mobile emergency diesel generating station; also a 16-cylinder engine from the firm's SV series, applicable to industrial, rail-traction and marine duties. Another exhibit was an English-Electric 8V/8SV package unit for oil field duties, skid mounted. It is claimed to have a one-hour rating at 850 rpm of 1066 bhp, and a 12-hour rating of 970 bhp. Overall length is only 17 ft. Another exhibit was the 16-cylinder Vee-type engine which, when exhaust-turbo-pressure-charged, gives a continuous output for industrial uses of 1800 bhp at 750 rpm. It is the latest development of the well known "K" engine which came first off the production line in the early 1930's.

A new Petter-McLaren engine manufactured by J. & H. McLaren Ltd., Leeds, is the "LE" engine. It is normally aspirated in 4- and 6-cylinder types LE4 and LE6, and supercharged as LEB4 and LEB6. The makers claim that introduction of these compact high-speed and lightweight types have been made to meet requirements for dual-frequency sets, for earthmoving equipment, compressors and for contractors' power plants. Bore is 5⅝ in., stroke, 6 in.

The firm of Pelapone Engines Ltd., Derby, exhibited their new Pelapone-Ricardo automatic generating sets for telecommunication systems. It is claimed that no break occurs when switching over automatically if main electricity supply fails.

Recent contracts include The Canadian Micro-Wave system, and similar systems in various countries of the British Commonwealth. The present range covers power requirements from 2.5 to 70 kva. Three classes of diesel-generating sets are available, — "Standby to Mains", double unit "Mutual Standby", and "No-Break" sets for full continuity. The main item is energy stored in a

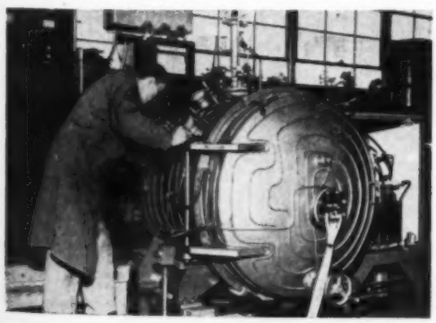
flywheel which is sufficient to continue to drive the loaded alternator until the engine takes up the drive.

A number of diesel-electric paddle wheel vessels have been ordered by the British Admiralty on account of the suitability of this type of propulsion for the special types of work. Two of these tugs will be built by Yarrow & Co. Ltd., Scotstown, and are to be named *Director* and *Dexterous*. In the machinery spaces are installed four Paxman 12-cylinder V-type engines, each coupled to a 399-kw generator of British Thomson-Houston make, running at 1600 rpm. Current is supplied at 305 volts to the propulsion motors, each of which transmits 800 bhp at 212 rpm. The drive is taken through Renold chains, giving a reduction of about 8:1. Current for lighting and power is supplied by four six-cylinder Foden diesel engines on 60-kw, 200 volt generating sets. Two Reavell air compressors are provided, one being electrically driven, and the other coupled to an Enfield diesel engine. Two centrifugal De Laval oil purifiers treat about 100 gallons of diesel oil per hour. The tugs are intended primarily for harbour service. The length of each vessel is 157 ft. overall.

A contact said to be the biggest ever placed with a British firm for diesel-electric locomotives has been received by Crossley Bros. Ltd. of Openshaw, Manchester from the Irish State Railways. The 94 locomotives are being built by Metropolitan-Vickers Electrical Co. Ltd., of Trafford Park, Manchester. They will be powered by Crossley diesels. Sixty Crossley engines will have 1200 bhp and 34 will produce 550 bhp. There will be five spare engines. The new locomotives will replace steam and will be in service within about two years. It is estimated that the change-over will effect a saving in fuel costs of one million pound sterling per annum.

Great attention is paid among British manufacturers of diesels to pressure charging. Napier Turbochargers are now very much favored for units of 200 bhp and over. High-pressure turbocharging is, however, less popular in Great Britain than in U.S.A. and Switzerland. It seems that about 50% power increase satisfies users at the present time, but future developments will no doubt follow the general trend of obtaining larger increases in output by using higher pressures.

Investment Casting Process



The first vacuum melting furnace designed specifically for the investment casting process has been put into operation on an experimental and pilot production basis by Austenal Laboratories, Microcast Division, at its Dover, N. J., plant. This company makes numerous components for the diesel industry including thrust bearings and turbine wheels.

Introduction of vacuum melting to investment casting is expected to extend considerably the versatility of the process, permitting the use of a wider range of alloys and insuring greater strength and ductility of alloys now being used. Specifically, the melting of metals in a vacuum eliminates harmful gases, and undesirable oxides and slag compounds. The appearance of these elements in a standard melting process has limited the choice of alloys used in investment casting to those that are not affected or affected only slightly by these undesirable factors.

Although vacuum melting is being used in the investment casting process for the first time, it is widely used in other segments of the metals industry, such as in casting nickel ingots for the electronics field, in the production of high carbon bearing steels, and in melting high temperature wrought alloys that suffer high oxidation loss.

The investment casting process is used primarily to mass produce small precision parts in a wide range of alloys, ranging from the high strength, high temperature alloys, through the stainless steels, to the carbon and low alloy steels.

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INFREQUENT ADJUSTMENT
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* ROCKFORD Over-Center CLUTCHES remain in or out of engagement until changed by the operator. The smooth, easy, anti-friction engagement—obtained by roller cams pressing against the pressure plate face — progresses from "release" to "on center" to slightly "over center" where the clutch locks in engaged or running position.

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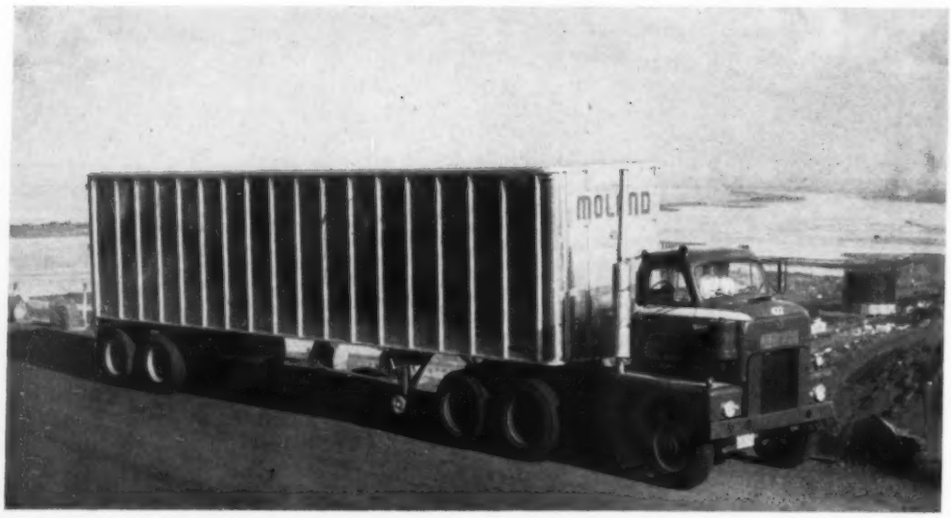
CLUTCHES

Truck Fleet Modernization



SALE of 30 diesel-driven, cab-over-engine International Model DTC-405 Roadliners to Moland Brothers Trucking Co., Duluth, highlights a $625,000 fleet modernization program launched by this common carrier. Truck-tractors involved in the sale are 128-in. wheelbase units equipped with 180-horsepower Cummins HRFB-600 diesel engines, They employ Eaton two-speed driving axles and pusher-type second rear axles, Fuller five-speed direct-in-fifth transmissions and other specialized components. Delivery of the trucks from Harvester's Emeryville, Calif., plant is under way.

"Use of models incorporating International's COE design," said H. T. Moland, general manager, "will enable us to pull a greater load capacity and provide better weight distribution and still remain within the legal length and weight limits of highways our tractor-trailers travel in Minnesota, Wisconsin, Michigan and Illinois." Moland's new equipment also included 35 tandem-axle "high cube" trailer vans. With all new units in service, the carrier's prime over-the-road equipment for line hauls will be International cab-over-engine models pulling the new 36-foot semis.

In conjunction with its purchase of Internationals, the Moland company contracted with Harvester's motor truck division to service all new trucks under the manufacturer's guaranteed maintenance program. Under terms of the agreement, International Harvester's Duluth motor truck branch will handle complete maintenance of the new trucks.

The new Internationals, Mr. Moland said, replace conventional-type, dieselized truck-tractors in the company's 150-unit fleet and mark the company's initial use of cab-over-engine equipment in highway transport. Rated at 76,800 pounds gross combination weight, the DTC-405 Roadliners are fitted with Timken 11,000-pound capacity front axles. The two-speed rear driving axles, mounted behind the pusher (dead) axles, are of 22,000 pounds capacity, with 4.33-to-5.82 ratio. Mr. Moland's new trucks also have 10.00 x 20 twelve-ply tires, dual 70-gallon aluminum fuel tanks, semi-trailer connections with buzzer and breakaway valves, air brakes, air horns, dual windshield wipers, oil filters, recirculating heaters and defrosters, automatic radiator shutters, front tow hooks, directional signals and vertical exhaust stacks. The Cummins engines turn at 2000 rpm.

The company's multiple equipment purchase, according to the firm's general manager, is the most significant in the firm's 25-year history. Mr. Moland brothers H. T., Clarence, Howard and Lothard started their freight trucking business April 1, 1930 at Bayfield, Wis., with a single highway rig. First cargo was fish, hauled from the Lake Superior port to Chicago, and meat, transported on the back-haul to northern Wisconsin. In 1931 the company expanded, transferring its headquarters 70 miles west to the Minnesota city where Moland Brothers is now regarded as the largest Duluth-based highway shipper. Its major run is Duluth to Chicago, with service to such points as Milwaukee, Stevens Point, Ashland and Eau Claire in Wisconsin, Ironwood, Mich., and St. Paul-Minneapolis. Cargo contributing to increased traffic volume handled on Moland routes includes supplies for the Mesabe range taconite industry and the new Air Force base at Duluth.

Air Testing New Pipeline

AMERICAN Louisiana Pipe Line Co. will air test about 1,000 miles of 30-inch gas pipe line which is being constructed from Detroit, Michigan, to North Tepetate, Louisiana. Testing of this pipe line project began at Willow Run, Michigan, during the latter part of September and will extend on into Louisiana as the line progresses. The equipment used for this testing will consist of 10 Caterpillar D337 diesel engines which furnish power for Gardner-Denver compressors to produce the necessary pressure as part of the test.

Each individual test unit is composed of 3 engines; 2 low-stage compressors and 1 high-stage compressor. The 2 low-stage compressors feed directly into the suction of the high-stage compressor. The low-stage compressors develop 150 pounds and the high-stage compressor develops up to 1,000 pounds pressure. Upon completion of the fabrication of connections, the low-stage compressors were subjected to 300 pounds per square inch pressure tests and the high-stage compressors were subjected to 1200 pounds per square inch tests. These tests were run for a period of 24 hours and recording charts were made for the entire period. Six men will comprise the operating crew for 1 complete unit and will operate in 8-hour shifts of two-men crews in each shift.

When a section of line is tested, it will be brought up to 944 psi pressure, which is a minimum of 10% above the maximum operating pressure, and this pressure will be checked by a dead weight tester and a recording chart will be made for a 24-hour test period. After a completed section of line has been tested and the pressure check completed, the pressure will then be bled into the next section which is ready for test. These test sections will vary from 5 miles to 15 miles in length. The first portion of the pipe line project will be the 400-mile section to be tested as the construction is completed this fall. This section will extend from the Sales Station at Willow Run, Michigan, to a point of connection with Texas Gas Transmission Corporation at Slaughters, Kentucky.

New Orleans Diesel News

By James W. Calvert

NORMAN LAFORTE of Galliano, La. is building his own 75-ft. towboat which is to be powered with two Caterpillar 397 diesel engines, rated 500 hp at 1200 hp, and two 20-kw Caterpillar generator sets. The machinery was sold by Boyce-Harvey Machinery, Inc.

UNDER construction at Golden Meadow, La., is an 80-ft. tug for Nolte Theriot, of that community. He is installing twin Caterpillar 500-hp diesels, Model 397, and Caterpillar 311 generator sets.

BOYCE-HARVEY Machinery, Inc., has sold a pair of Caterpillar 397 diesels to Louisiana Marine Contractors, Inc., for installation in a new 70-ft. offshore tug. The vessel is nearing completion at Lockyard Shipyard. The main engines are rated 500 hp at 1200 hp. Auxiliary equipment includes two Caterpillar 20-kw generator sets.

A NEW Mississippi River ferry, nearing completion at Calcasieu Shipbuilding Corp., Sulphur, La., for the Louisiana Highway Department, will be powered with two Caterpillar diesel engines, Model 364, rated at 230 hp. The engines were sold by Boyce-Harvey Machinery, Inc. The ferry is to go into service on the Mississippi River at St. Francisville.

REAGAN Equipment Co., New Orleans, has sold a new Waukesha diesel engine, Model 135DKB, rated hp at 2800 rpm, to the B&G Crane Service of Harvey, La. It will be used to power a Model 150 P&H mobile-type crane.

WOODARD, Wight & Co., New Orleans, has purchased another Waukesha diesel engine, model 180 DLCU, rated 94 hp at 2200 rpm with 2.86:1 reduction gear and clutch, for use on a hoist employed in the construction of the Lake Pontchartrain causeway. The engine was sold by Reagan Equipment Co.

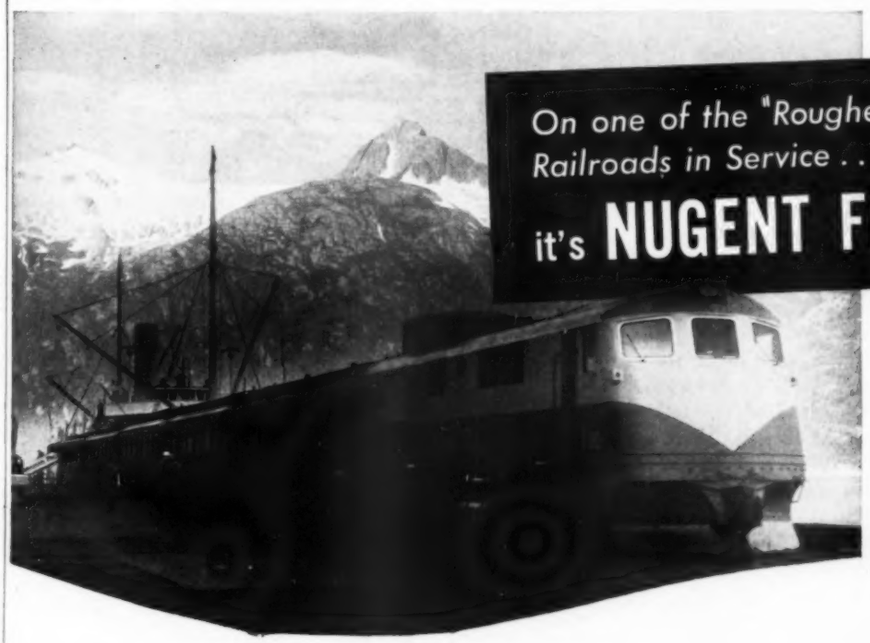
J. RAY McDERMOTT Co. has purchased two Model NKDBS Waukesha diesel engines to drive two Electric Machinery 150-kw generating sets on its offshore derrick barge No. 10, now under construction at Avondale Marine Ways, New Orleans. Reagan Equipment Co. sold the engines.

THE DREDGE *Albatross*, owned by Southern Shell Products Co., Morgan City, La., has a new 175-kw Superior diesel generator set, Model 40S6, 8½x10½ in., rated 720 rpm. The equipment was installed by Arthur Duvic's Sons, New Orleans. The dredge is used in an oyster shell dredging operation off Point Au Fer on the Louisiana coast.

GULF CANAL LINES, Houston, Texas, has purchased Superior diesel engines, Model 40-MX8, each rated 550 hp at 750 rpms, to power its three new twin-screw canal towboats now being constructed by Calmes Engineering Co.

THE CONTRACT for supplying diesel main propulsion engines for the fleet of ice-resistant cargo ships to be built at Avondale Marine Ways, New Orleans, has been awarded to the Alco Products Corp.

A NEW 165-ft. marshland oil drilling barge, powered by a battery of GM diesel quads of 1800 hp with auxiliary power supplied by two 75-kw 220/110-volt, three-phase Caterpillar diesel generating sets, has just been completed by Alexander Shipyard, Inc., New Orleans, for the Mississippi River Fuel Corp. The barge, which has been christened the *Roscoe Hobbs*, is being operated by the H. L. Rowley, Inc. in the Louisiana marshland oil fields near Golden Meadow.



Nugent Fig. 1280GW Duplex Fuel Filter.

Nugent Fig. 1280CP, 1R and 1S Pressure Fuel Filter.

● Actually rough going is putting it mildly.

● Temperatures of 90° in summer to 65° below zero in winter! Blinding blizzards that build snowdrifts up to 20 feet in some areas, and winds that fill a locomotive cab full of snow in minutes . . . the kind of weather that causes trouble with ice and wax in the fuel oil. 111 miles of steep grades and sharp, *15 to 20 degree curves!* These are the unbelievable conditions under which the White Pass & Yukon diesel locomotives must operate. This gives a pretty clear picture of why top-flight, dependable equipment is a must. Every mechanical element must do a job. *And do it well!* That's why Nugent filters were selected for filtering requirements on both 800 H.P. diesel engines.

● Regardless of weather or the strain of "open throttle" operation, the Nugent filters do their part of the job well. The Nugent filters continuously filter out dirt particles as small as a few microns and prevent them from entering the engine's fuel system where they might cause wear of injection-pump plungers and fuel nozzles. The lube oil strainer gives full flow protection of lubrication to the engine bearings without frequent servicing of the strainer because of large dirt holding capacity of the strainer basket.

● This is another example of a leading company recognizing the long range effectiveness of Nugent filters . . . and why it is *the first choice* on so many diesel engines. *It will pay you to follow this example.* Whatever your filtering requirements—fuel, lube oil or coolants—there's always an economical Nugent filter available of proper size and type. Write for full details on how Nugent filters can improve the efficiency of your operations.

Nugent Fig. 1554AL #4L Lubricating Oil Strainer.

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HEAT PROBLEM SEEN AS BLOCK TO POWER INCREASES IN DIESELS

By HEINRICH SCHNEIDER

THIS paper is a report for my friends, the designers of diesel engines. It gives results and conclusions from practical experience. For the purpose of comparing the heat load of diesel engines, an emperical heat factor (HF) has been established for our personal use, equaling the cylinder diameter D times the mean effective pressure (MEP), times revolution (RPM), times C equaling ¼ for four-cycle engines and ½ for two-cycle engines, times a constant K. (HF = D × MEP × RPM × C × K).

This heat factor is figured for engines taken at random from publications of data of the last years of the various manufacturers in the attached table. We have taken HF equals 3.0 emperically as 100% for continuous operation. We are fully aware of the shortcomings of this emperic HF formula. The main purpose was to keep it simple, to be able to figure in a minute the HF comparison of different engines. We have neglected stroke-bore ratios, which are more or less alike for these engines, combustion chamber designs, type of cooling and other factors. It is surprising how this HF data gives valuable experience comparison of top ratings of the different engines.

There is plenty of leeway left to improve and complete this formula, but for the following practical comparison it serves the purpose well. All engines compared are open chamber combustion engines. The table shows, that for the different types of locomotive diesels in the first five columns, the HF varies in a surprisingly small range from about 100% to 125%, even though each manufacturer has tried to increase the power capacity.

The first three engines in the table are four-cycle supercharged engines, the engines of Lines 4 and 5 are non-supercharged two-cycle engines of different types. Line 4 is an opposed-piston engine and 5 a uniflow scavenging engine with exhaust valves in the cylinder heads. Lines 6 to 8 show Cummins four-cycle engines non-supercharged and supercharged, and the racer engine with HF of 90, 125 and 180%, respectively. Line 9 below shows a GM two-cycle truck engine with

HEAT-FACTOR OF DIESEL ENGINES

$$HF = DIA \times RPM \times MEP \times C \times K$$

C=¼ for 4 cycle
C=½ for 2 cycle

$$K = \frac{1}{100{,}000}$$

HF=3.0=100%

Line	Engine Make	Cycle	Cyl. Dia.	RPM	MEP	Heat factor	HF in %
1	Alco	4	9	1000	165	3.72	124
2	Baldwin L. H.	4	12¾	625	170	3.38	113
3	Lima-Hamilton	4	9	950	165	3.52	117
4	F-M O.P.	2	8¼	850	90	3.11	104
5	Electro-Motive	2	8½	835	90	3.2	107
6	Cummins	4	5¼	2100	100	2.68	90
7	Cumm. Sup. Ch.	4	5¼	2100	140	3.75	125
8	Cummins Racer	4	4½	3000	160	5.4	180
9	General Motors	2	4½	1800	80	3.24	108
10	Low Speed	2	16	300	62.5	1.5	50
11	Low Sp. Sup. Ch.	2	16	300	125	3.0	100
12	Nordberg	4	13	450	160	2.34	78
13	M. A. N.	4	11.8	400	215	2.54	85
14	Sulzer O. P.	2	7½	750	170	4.8	160
15	Free Piston Engine	2	8¼	1100	250	11.2	374

Editor's Note: Mr. Schneider is widely known and highly respected in the diesel industry. He has held such positions, for example, as chief engineer for both Fairbanks-Morse and Hooven-Owens-Renschler. Consequently, we are glad to have the opportunity to print his views on this debatable subject. It should be understood that the opinions expressed are those of the author and do not necessarily represent the opinions of this publication. Mr. Schneider has retired from active business and is now living in Kittredge, Colorado.

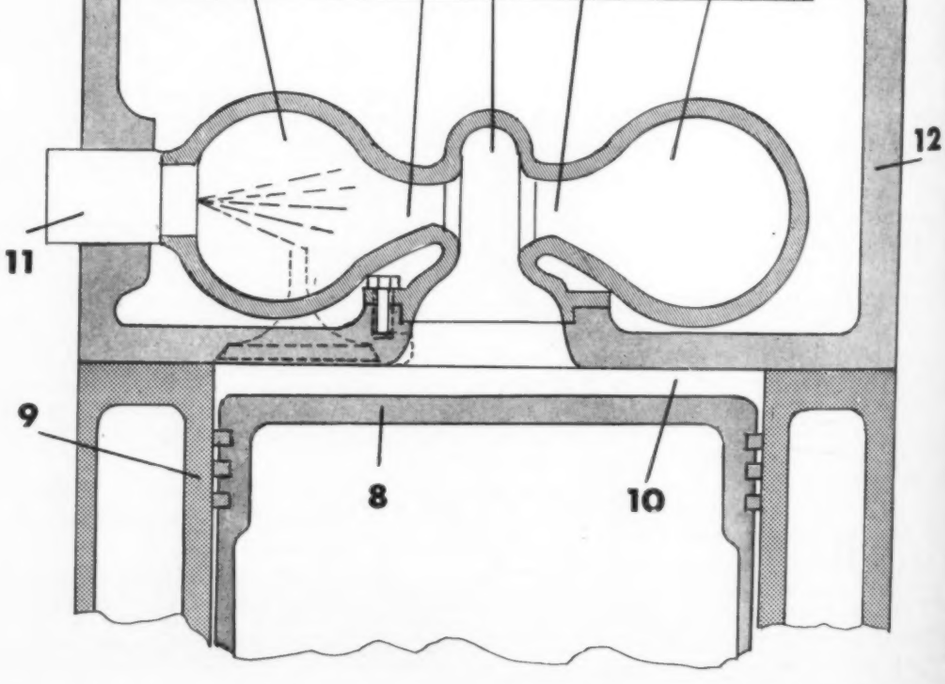
an HF of 108%. Lines 10 and 11 show a low speed two-cycle engine non-supercharged and supercharged with HF of 50 and 100%. Line 12 shows a Nordberg supercharged four-cycle engine with an HF of 78%, and Line 13, the high supercharged MAN four-cycle engine with an HF of 85%.

About 10 years ago Sulzer Brothers in Switzerland published an astonishing development and the remarkable results obtained with a high supercharged two-cycle opposed-piston engine with low fuel consumption with HF of 160% (see Line 14). Nothing has since been heard of sales records or the service of such engines. Free piston engines have had much publication during the last score of years. Several manufacturers have taken up its development here and abroad. Most have abandoned it. Its heat factor for full power is from 300% to 400%. Why the free piston engine, Line 15, should be able to operate satisfactorily with a two or three times higher HF than the opposed piston crankshaft engines of Line 4 is a major mystery.

With the increase of the HF above 100%, the life of the engine is shortened due to piston ring and liner wear, and to piston, cylinder head and valve problems. From the table we see that engines operating continuously have HF below 100% and locomotive and truck engines for intermittent service around 100% to 125%. Piston design is at a high stage of development, and only small progress can be expected from further improved piston designs. Endless endurance tests have been conducted with those highly developed piston designs which are already at the limit of their heat load. Can we expect new spectacular improvements of piston designs? Does any coating change the situation basically? Just as much progress has been made with piston ring designs and with metallurgy. There may be still further improvement in metallurgy, improvement in or over chromium plated rings and cylinder liners and lubricating oils. But if we go to extremes in our assumption and increase the heat load in the present engines

. . . . *and now please turn to page 46* . . .

Fig. 1—Suggested removal of combustion chamber outside cylinder. 1 & 2, dual combustion chambers, No. 1 acting as precombustion chamber; 3, common nozzle mouth-chamber; 4 & 5, nozzles, arranged in coaxial relationship, facing each other; 8, piston; 9, cylinder; 10, working cylinder space; 11, injector; nad 12, cylinder head. See text for theory of operation and attainment.



West Coast Diesel News

By James Joseph

OR the boat *La Diana,* owned by J Santi, San Diego, a Model 2071-A M diesel with 3:1 reduction. Sale rough Crofton Diesel Engine Co., Inc.

OR use as a log-hauler on contract with ntiam Lumber Co., a new Model 851 mond T rig powered with a Model DAT-779 Buda turbocharged diesel, e truck belonging to Stokes Trucking ., Sweet Home, Oregon. Sale rough Hamilton Engine Sales, Inc.

ELIVERED to the City of Oxnard (Calif.) Sewage Disposal Plant, two da sewage gas engines complete with lowers and vapor-phase systems. Sale Anderson-Bevier Co. Inc.

GM TANDEM 6-71 diesel has been ld to Union Oil Co. for the mud rew vessel *Noodnick*. Unit has 5:1 reduction and two direct-drive front wer take-offs.

OR William Stewart, Jr.'s yacht *Tabasco,* a GM Model 4071-B, one of M's lightweight aluminum engines.

O T. B. Cook Engine Co., Portland, ur new 6DANR-273 Buda marine enes for repowering pleasure and work ats operating Portland waters.

NOTHER recent Portland installation a 6DTS-468 Buda diesel which pows a mobile gravel plant operated by wyer Lumber Co.

AKERSFIELD, Calif.'s Oilfields Truckg Co. has taken delivery of three da 6DA-844 diesel truck engines, for powering some of its fleet.

OR *Passat,* owned by Allan Kemp, a M 4-51 with 3:1 reduction. Sale by rofton Diesel Engine Co., Inc.

HE commercial fishing vessel *Hi-Ho,* wned by San Pedro's John Elgin has en repowered with a GM 6-71 engine, with 3:1 reduction.

O COWLITZ County Road Dept., Kalama, Wash., a new HP-351 Buda to epower their 15-B Bucyrus shovel.

ALBERT ZUBER, Orick, Calif. has aken delivery of a 6DAS-779 Buda, repowering his LTSW Mack, which hauls short logs over-the-highway in the Orick-Arcata area.

OLD for the boat *Bernard Pedro,* a M 2061-A auxiliary unit. Owner is oe Mangiapone, San Diego.

A GM 62203-RA has been sold for the commercial fishing boat *Ross Ann,* owned by San Diego's Leo Tarantino.

TO WEYERHAEUSER Timber Co., Klamath Falls, Oregon, an FT 75-24 Buda forklift truck for the company's hardwood plant. Truck is equipped with dual cushioned tires and special 168-in. mast; it's powered by a 6B-320 Buda.

COLUMBIA Veneer Co. has purchased an FTD 40-24 forklift truck with 4BD-153 Buda diesel.

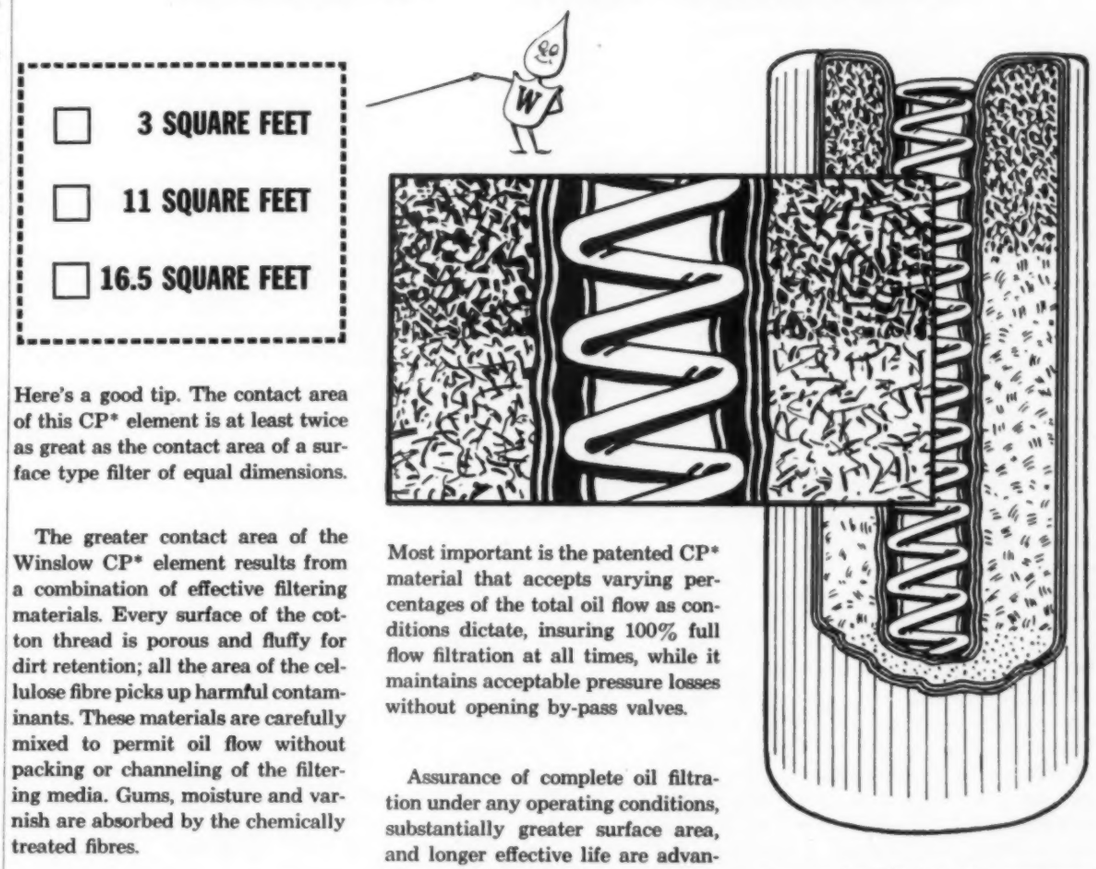
TO MULTNOMAH County, Portland, Ore., an L-525 Buda for repowering a 22-B Bucyrus shovel, the rig operating at Kelly Butte, in the Portland area.

WESTERN Electric Co., Inc., San Leandro, Calif. has taken delivery of nine Fairbanks-Morse 45B3½, 3-kw diesel generator sets.

FOR James Cowan, San Diego, a Fairbanks-Morse 45B3⅛, 5¼-hp diesel.

TO Fullerton Equipment Co., Ukiah, Calif., a Fairbanks-Morse 45B4⅛, 10½-hp diesel engine.

How Much Surface Area is there in this CP* Filter Element?



Here's a good tip. The contact area of this CP* element is at least twice as great as the contact area of a surface type filter of equal dimensions.

The greater contact area of the Winslow CP* element results from a combination of effective filtering materials. Every surface of the cotton thread is porous and fluffy for dirt retention; all the area of the cellulose fibre picks up harmful contaminants. These materials are carefully mixed to permit oil flow without packing or channeling of the filtering media. Gums, moisture and varnish are absorbed by the chemically treated fibres.

Longer Useful Life

In the CP* element, oil passes through V-shaped traps in which contaminants are progressively caught, according to particle size. Instead of massing on the outside of surface filters to eventually become impervious, these contaminants gradually fill the V-shaped traps, so that the element has substantially longer useful life.

Most important is the patented CP* material that accepts varying percentages of the total oil flow as conditions dictate, insuring 100% full flow filtration at all times, while it maintains acceptable pressure losses without opening by-pass valves.

Assurance of complete oil filtration under any operating conditions, substantially greater surface area, and longer effective life are advantages of Winslow CP* elements that have been proved by thousands of engine owners. These exclusive advantages can be demonstrated on your engines. Let us give you complete data on filters and elements for your equipment. Please write or call the nearest office.

This is the answer to filter area: The contact area of this Model 935-0 element is composed of cotton thread and cellulose fibre with a total effective filter surface area of 16.5 sq. ft. An average surface type element of this size has an effective area of 7.2 sq. ft.

WINSLOW FILTERS

CP is fully protected by patents and trademarks*

Winslow Engineering Company, 4069 Hollis Street, Oakland 8, California • Eastern Factory: Murray, Kentucky

Heat Problems

(continued from page 44)

until the piston rings are almost red hot, does anybody expect such hot rings to stand up with any metallurgical improvements, or better lube oils?

There remains one direction of solution to these problems to keep extreme heat away from the piston rings, piston tops and valves. As long as engine designers expect a solution of the heat problem by metallurgists or lubricating oil experts, they can keep on waiting for a long time. In high speed and high supercharged engines, peak pressures and temperatures are getting so high that they have become a barrier to further increase of power capacity.

Years ago, with low speed engines, the problem was to keep the heat loss small, while today, with high power capacity engines, the problem is to avoid too much heat and pressure on piston rings and valves to keep them operating satisfactorily in continuous operation. A basic evolutionary step has to be taken to break through the wall which the present heat problem has erected. This conclusion suggests removing and transforming the combustion process outside of the cylinder proper away from piston and valves, in separate combustion chambers, which would have to take the peak pressure and temperature and complete the combustion. If possible or not, the endeavor will have to be made in this direction if further substantial power increase shall be obtained in diesel engines. A very important requirement in such a transformation is a speed up of the velocity of combustions to be able to complete the combustion in the removed combustion chamber outside the cylinder.

An attempt and possibility in this direction is shown in Fig. 1, consisting of a combustion chamber unit of a diesel engine, comprising two combustion chambers, 1 and 2, separately arranged from the working cylinder 9 and in opposed relationship to one another. Each of these has a nozzle, 4 and 5, connecting its respective chamber, 1 and 2, by means of a common nozzle mouth-chamber 3, with the working cylinder space 10, formed by piston 8, cylinder 9 and cylinder head 12. The nozzles are arranged in coaxial relation and face each other and have their orifice mouths arranged so close to each other on opposite sides of the nozzle mouth-chamber 3, that the major part of a jet of fuel-air mixture and combustion gas blown out from one combustion chamber will enter the opposed combustion chamber. The left hand combustion chamber, 1, is operating as a precombustion chamber in which the fuel is injected by injector, 11, and ignited. This results in a pressure increase, whereby a high velocity jet of the fuel-air-gas mixture is produced by partial combustion by converting the pressure into velocity. It is blown from this chamber into the opposed combustion chamber where further combustion and pressure increase takes place. A jet from this chamber blows back into the first chamber and back and forth. During the expansion stroke, jets from both combustion chambers are blown head on against each other in the nozzle mouth-chamber, the jets producing repeated violent turbulence of the mixture of fuel and air for fast and complete combustion.

This jet combustion produces an additional violent mixing, by the impinging of the two jets from the precombustion and air chambers in the nozzle mouth-chamber, which causes a substantially complete combustion before fuel can enter the working cylinder. Fuel in liquid or gaseous form, which has not yet burned in the precombustion or air chamber, does burn in the nozzle mouth-chamber in the extreme high temperature produced by the impinging and mixing of the already very hot jets and combustion of the remaining unburned fuel.

If heavy fuel is used, the lighter part is burned in the precombustion chamber, heavier parts are burned in the air chamber and the remaining heaviest parts burn in the nozzle mouth-chamber and no heavy liquid fuel can penetrate in the cylinder which could coke and varnish the piston and piston rings, which cause the major difficulties in burning heavy fuel. Spherical combustion chambers are preferable for high pressure and can be made thin-walled for good cooling, compared with flat piston tops and cylinder heads. The combustion gases flowing in the cylinder are still hot. It is not intended to take too much heat out of the gases in the combustion chambers, but burning fluid torches do not impinge upon moving operating parts. The core of combustion heat is removed from piston and valves, and radiating heat on these parts is greatly reduced.

Some high speed diesel engines operate with excessive peak pressure, some with knocks like hammer blows. In gasoline engines, knocks have been eliminated by high test gasolines. The diesel manufacturers take it because no means has been found to eliminate it.

The peak firing pressures and temperatures in above design, Fig. 1, are confined to the combustion chambers. No fuel injection and combustion torches can impinge on piston and valves as in conventional diesel engines. The engine operates with little pressure rise in the cylinder compared with fast pressure rise in conventional high speed engines, and operates without knocks. The higher the supercharging, the more excess air, not necessary for the combustion of fuel, can be left between the piston and the cylinder head, serving as a heat insulator, and when the combustion gases flow into the cylinder this relatively cool air is pushed toward the piston rings, thus preventing the hot gases from reaching the rings. The injection and combustion torches and peak combustion heat and pressure are placed in a separate combustion chamber unit, which can be easily cooled and replaced and made of thin-walled corrosion and heat resisting material.

In the conventional high speed diesel engine, the combustion is so slow that it does not only continue over the expansion stroke but in some cases continues in the exhaust pipe. The high firing pressure in open combustion chamber engines is the result of early injection, necessitated by the inherent slow and imperfect mixture and combustion, to avoid after-burning and smoke, and causes knocking and noisy operation and calls for heavy structural design. The conventional precombustion chamber, the turbulence chamber, the energy cell engines do not provide means to accomplish complete combustion before fuel or gas reaches the cylinder proper and acts on the piston, as the above described new design does. The latter can use all types of fuel and their particular advantage in burning heavy fuels are obvious. Experience shows that precombustion engines with high peak pressure in the precombustion chamber run quietly, while open chamber engines with the same peak pressure knock.

With the combustion taking place outside the cylinder, removed from piston, valves and liner, new possibilities open up for increasing the power capacity of the engine, without shortening its life and operation with higher heat factors than with open chamber engines becomes visible. The period during which the hot gases expose the heat on the piston is reduced because the combustion process occurs outside of the cylinder and the hot gases enter the latter progressively and later than in the open chamber engines.

In years to come, combustion engineers will wonder how some engines operated satisfactorily in the past, injecting fuel torches directly in the cylinder, on the piston top and the valves. What a crude treatment of the essential operating parts, and the exposure of the rings to so high pressure and heat. Experience shows that the firing peak pressure in the diesel engine rises with increasing revolution because the shorter time for combustion, which may be much less than one-hundredths of a second, calls for earlier injection, which causes rapid pressure rise. Mixing and evaporation of the fuel takes time. The velocity of combustion is a function of mixing and evaporation, while combustion of thoroughly mixed gas occurs almost instantaneously as experienced in the spark ignition gasoline engines.

While fuel is injected in a forced air stream from the cylinder blown into the precombustion chamber in the new combustion chamber engine, Fig. 1, an automatic chain reaction combustion process follows, starting in the precombustion chamber, progressing into the air chamber 2, and being completed in the nozzle mouth-chamber 3. Faster and improved combustion can be obtained by faster and more thorough mixing of fuel and air and seems to be possible only by violent and repeated turbulence, which is the inherent feature of the design shown in Fig. 1.

Why do the British restrict the revolution of their relatively small truck diesels to 1800 rpm? Because economy is their prime requisites, and, with higher speeds, the fuel consumption increases rapidly. Not because of increased pumping losses which gasoline engines do not show, but because in the open chamber engines the combustion is too slow at the higher speeds attained.

Low speed engines with low heat factor (HF) can stand a great deal more supercharging without effecting engine life. It is the high heat factor, (HF), not the turbo supercharger which limits the power capacity of the engine. How much work and money is expended by not recognizing this fact? At present there seems to be no immediate limit of increasing power capacity of an engine by supercharging, except the heat problem in the power cylinder, and not in the exhaust turbine, as was expected in the past.

Four-cycle engines have doubled their mean effective pressure in the last 25 years by supercharging. Why did the two-cycle engines not do the same? Sulzer Brothers have proved about 10 years ago that two-cycle engines can double the mean effective pressure with very good fuel consumption. This engine operated with a heat factor of 200% to 300%. It never went into production, and the high heat factor indicated that it would not stand up in continuous operation with the present designs. Four-cycle engines have been supercharged experimentally to 200 to 300 MEP but have never been sold for such loads. Why? The heat factor was up to 150 or 200%.

As long as the two-cycle engine drives mechanically, the scavenging blower instead of by an exhaust turbine, and only higher speed is used to increase the power capacity, the two-cycle engine is inferior to supercharged four-cycle engines in high capacity engines. In supercharged engines, the mechanical efficiency is higher than in non-supercharged engines because the pumping losses are lower, and the friction losses, in relation to the fatter indicator diagram and higher MEP, are lower. Supercharging of the two-cycle engines can be achieved without increasing the HF by lowering the RPM and increasing the MEP, whereby the pumping losses are reduced and the fuel consumption lowered.

The conversion of exhaust energy in superchargers continues to make progress, enhanced by the progress made by gas turbines for airplanes and the development of the superchargers for two-cycle engines, and its matching to the engine has just begun. The exhaust turbine produces the supercharging back pressure without the use of valves for loading, and this engine is of the most simple design. Excess air, necessary for efficient scavenging lowers the gas temperature at the turbine. Less restricted flow through a valveless engine reduces the pumping losses. It looks as though most progress in the future can be expected by supercharging two-cycle engines.

We call attention to the fact that the HF of the engines in the table refers to open chamber diesel engines. With combustion chambers arranged outside the cylinder proper, the HF limitation discussed above does not apply and it is expected that greatly increased power capacity becomes possible. Some manufacturers have fully recognized that the heat problem in the diesel engine limits the power capacity of highly supercharged engines to present power ratings, others endeavor in, and continue with closed eyes to the impossibilities with conventional means.

C. Lee Cook Appointments

R. A. Darling

S. J. Altman

The appointment of Darling-Kenady Company as Denver representatives and S. J. Altman as the Florida and Southern Georgia representative for the C. Lee Cook Company has been announced by Philip W. Mettling, president of C. Lee Cook. Darling-Kenady headquarters are in the Mining Exchange Building, Denver. The S. J. Altman offices are at 808 Acosta St., Jacksonville, Fla. The Darling-Kenady organization is headed up by R. A. Darling and Phil Kenady, both of whom hold degrees in mechanical engineering.

Prior to establishing their own firm, both men were for many years with Cooper-Bessemer. For 25 years before establishing his own business, Mr. Altman was a lubrication engineer with the Texas Company.

White Bulletin

The Autocar Division of The White Motor Company has just issued a new version of its Autocar Diesel folder, describing the quality features and the complete line of Autocar diesel trucks for extra-heavy hauling jobs. The folder describes such Autocar manufacturing as "Nut and Bolt Construction", the Autocar driver cab, renewable bushings, frames, balanced driving assembly and others. Featured in the colorful folder is the Autocar diesel lightweight aluminum tandem. It is to be available in export sales and service markets in Spanish. For copies, write to Sales Promotion Department, Autocar Division, White Motor Company, Exton, Pa.

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AP 174-5a

Inland River Reports

By A. D. Burroughs

TWO Cummins turbocharged engines, model VT-12M are providing power for the sleek new twin-screw *Inland Trader*. Measuring 58x20, built by Levingston Shipbuilding Co. for Inland River Co., this new one carries complete modern electronic equipment and a Quincy air compressor.

MVBL's newly built *A. D. Haynes II*, equipped with Nordberg engines providing 4200 hp, was recently christened by the young Miss Phyllis Haynes at ceremonies at Dravo Corp.

A NEW all-aluminum boat now under construction at Sewart Seacraft, Inc. (Berwick, La.) for the Shell Oil Co. is reported to be nearly 700 pounds lighter than the conventional steel hull. The new craft will be powered by GM engines.

JOHN J. ROWE, the new vessel recently completed by St. Louis Ship for the Ohio River Co. deserved the many compliments received as the boat handled a tow of 30 barges, six wide and five long carrying 27,300 tons of coal. Baldwin-Lima-Hamilton engines produce the rated 3150 hp.

SUPERIOR engines, Model 80-MX-8 were giving good power for the *St. Louis Zephyr* as we saw this boat at the Alton, Illinois locks with a tow of 4,200,000 gallons of gasoline. Built in 1949 by St. Louis Ship for Streett Towing Co., this 2880-hp vessel is well known for her fine performance record.

P. W. RITCHIE is the new name for the former MVBL boat, *Royce Patton*. Now owned by Capts. John B. and C. L. Ritchie and used in harbor work, it is equipped with Fairbanks-Morse 4-cylinder 8¾x10½ engine, 120 hp., direct drive. This was originally the *Wm. B. Brokamp*, built back in 1938.

HARLEY WARNER, port engineer for Kanawha Sand Co. was on hand for the christening of this company's new vessel, the *Speck Criss*, recently completed by Barbour Metal Boat Works. Measuring 55x14.5 in hull size with a draft of 4 ft., two GM (Detroit) engines, Model 110 provide a total of 456 hp at 1800 rpm driving through Allison 3½:1 reduction gears.

DAVEY, the 15-hp dredge tender equipped with a Petter diesel engine with a 2:1 reverse-reduction gear, swinging a Michigan propeller, marked the complete dieselization of the fleet used by J. K. Davison and Bro., of New Kensington Pa., for dredging and towing operations.

SLIDELL, the new 880-hp tug built and owned by the J. & S. Shipbuilding Corp., is now in regular service between Baton Rouge and Nashville. Equipped with two GM (Detroit) 6-110 tandem twin engines, two Avondale propellers and Quincy air compressors.

CATERPILLAR engines provide the 800 hp for the M & M Towing Co.'s craft, *Betty Sue* seen downbound from St. Paul with barges of wheat and soybeans for the southlands. Built in 1952 at Vicksburg, Miss., it measures 80x24.

WE SAW the *J. L. Beatty* at Cincinnati. Owned by the Cincinnati Marine Service, and powered by three Murphy engines, two rated at 165 hp, one 190 hp, this tug can handle barges of approximately 12,000 tons with ease. Records indicate that these engines have 8000 hours without any major overhaul.

THE CRUCIBLE, equipped with Superior 8 cylinder diesels totalling 1066

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in these three spots

Even the cleanest fuel supply brings damaging dust, dirt and grit into your diesel engine. Without filtration, injection pumps gall, wear and lose their accuracy. Nozzles get plugged and burn. Even if your engine goes on running, the power output of individual cylinders goes badly out of balance.

So . . . effective fuel oil filtration is absolutely essential. For your engine to keep running at peak efficiency and with minimum outlay for maintenance, its fuel system should be equipped with PUROLATORS in the three areas listed at the right.

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Immediately before and after the transfer pump. The PUROLATOR on the suction side protects the pump. The one on the pressure side takes out any bits of metal worn from the moving pump parts.

In the fuel line before the injection pump. A PUROLATOR here is an inexpensive way to assure smooth, wear-free operation of the injection pump.

Built into each injection nozzle. While there is no obvious source of contamination beyond the injection pump, experience shows that an individual metal-edge filter element built into each nozzle assembly vastly improves nozzle life expectancy.

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PUROLATOR PRODUCTS, INC., Rahway, New Jersey

hp, was downbound with 12 barges of coal. One of the most dependable performers in river service, she is owned by Crucible Steel and built by Dravo four years ago.

NANCY JANE, the small active craft built last year by Dravo for Campbell Barge Lines and powered by Atlas Model 35 engine totalling 580 hp was upbound on the Ohio with barges to be loaded with benzol.

FLEETWOOD, powered by Cooper-Bessemer type LS-8 engines rated at 1400 hp, was active on the Illinois River during the recent weeks. Owned by Fleet Towing Co., Carlinville, Ill., this one was originally named *Minnesota Husky* when built in 1944.

SOUTHLAND, the hawser tug owned by John I. Hay Co., was another busy boat in the Illinois waters. We watched her southbound turning out a good time performance from power developed from her 800-hp Enterprise engines. These engines were placed in 1950 by Alexander Ship.

PERHAPS one of the most active boats in recent weeks on inland waterways was Blaske Line's *Jolly Roger.* One report indicated that this vessel powered by Kahlenberg engines rated at 200 hp made more than 18 trips through the locks in less than 7 days time. Built in 1937, it originally carried the name well remembered by old-time river folks—*Grover Stokes.*

TWO Enterprise diesel engines will provide 2560 hp for the new twin-screw 148-ft. river towboat scheduled for construction at Dravo Corp. for Island Creek Fuel & Transportation Co., Huntington, W. Va. This new craft will be named the *Raymond E. Salvati,* honoring the president of the Island Creek Coal Co.

Residual Fuel Economy

Marine operators who convert diesel motor ships to the use of low-cost "residual-type" fuels stand to save about one-third of their fuel bill per vessel, the Esso Research and Engineering Co. announces. A three-year study conducted on the M/S *Esso Little Rock* shows the fuels, if properly selected, also give performance and reliability equal to regular diesel fuels. The study shows that about 500 diesel ships throughout the world are currently using residual fuels. Motor ship demand for the fuel, which costs 35-42% less than regular diesel fuel, has increased 1,000% in five years, from two million barrels in 1951 to an estimated 20 million in 1956. This represents about 19% of all marine diesel fuel. Although this will create a growing demand for residual fuels, the study indicates this will probably not affect the supply or price situation immediately.

Because diesel engines are more efficient than steam turbines, the trend in recent years has been toward an increased use of motor ships in the 20,000-ton class and under. More than 60% of all ships built between 1950 and 1954 were diesel-driven. For the *Esso Little Rock,* conversion costs were $30,600. This included equipment to heat the fuel for proper centrifuging and atomization, a special system for pumping hot oil to main engines prior to starting, and adequate centrifuges for removal of increased sediments found in residual fuels. The actual annual net saving after the first year, based on 50,000 barrels of fuel, was $69,500.

IT'S HERE! JUST OFF THE PRESS! Bigger, better, completely revised, rewritten and brought up to date. It's Volume 20 of DIESEL ENGINE CATALOG, now ready for mailing. Mail orders are now being filled for this giant reference book with its all-new, profusely illustrated engine and accessory sections. Be sure of your copy of this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company form orders to DIESEL PROGRESS, Cole Station, Los Angeles 46, California.

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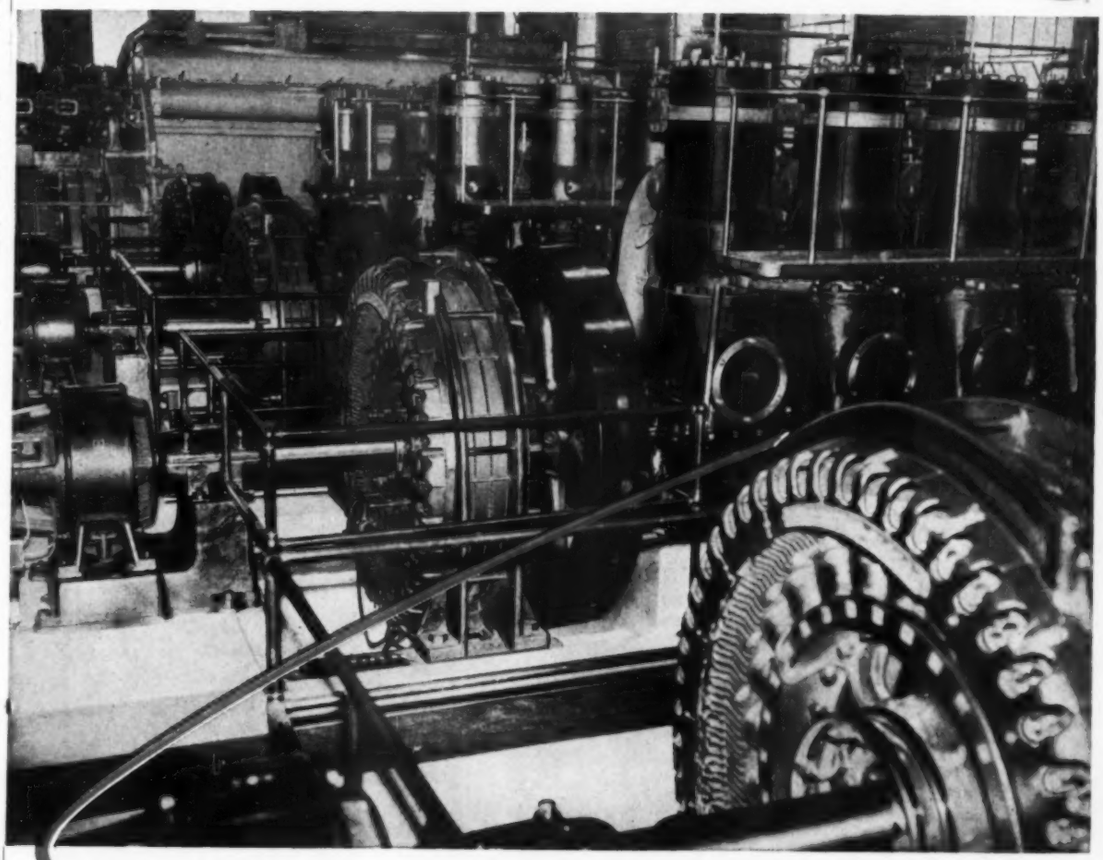

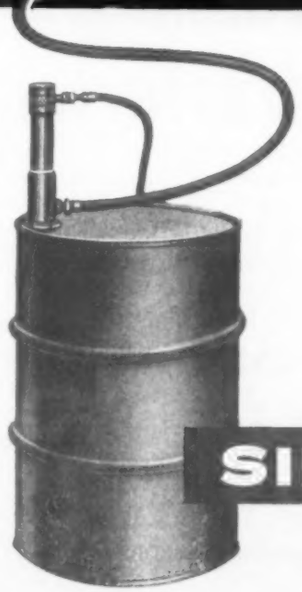

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SINCLAIR

GASCON OILS

Mid-Continent Diesel News

By Jack F. Cozier

JACKSON DRILLING CO., Great Bend, Kan., purchased through the National Supply Co., Great Bend, Kan., a GM model 12107 diesel engine. Diesel Equipment Co., Inc., Wichita, Kan., handled the sale.

B. D. WILMOTH, JR., Tulsa, Okla., bought a Cat D6 tractor with bulldozer and winch arrangement for oil field development from McCormick Machinery Co., Tulsa, Okla.

DOYLE GILBERT, Clinton, Okla., purchased a 365 cu. ft. Chicago Pneumatic compressor powered by a GM 471 diesel to quarry rock for the Clinton Air Force base. The sale was made by Leland Equipment Co., Tulsa, Okla.

YUKON MILL & Grain Co., Yukon, Okla., recently bought a Nordberg FSG-138-HSC dual fuel engine, rated 1600 hp, to pull a 1135 kw generator.

BURGESS CONSTRUCTION CO., Tulsa, Okla., has bought two Euclid 15½ yd. scrapers powered by two 6V GM diesels with torque converters and torqmatic transmissions. The units sold by Butler-Sparks Equipment Co., Tulsa, Okla., will be used on the turnpike.

CARDWELL MFG. CO., Wichita, Kan., purchased a Buda DA-844 diesel for installation on a Cardwell type R spudder from Buda Engine & Equipment Co., Tulsa, Okla. The spudder will be used by a contractor in western Kansas.

NATIONAL STEEL ERECTORS, Muskogee, Okla., bought a Unit 1520T crane with a GM 471 diesel as the power unit from Midwestern Engine & Equipment Co., Tulsa, Okla.

BOECKING CONSTRUCTION CO., Oklahoma City, Okla., has purchased a Koehring 405 crane powered by an IH 525 diesel. The unit will be used around Claremore on the turnpike and was sold by the Clarence L. Boyd Co., Tulsa.

EVERETT BUELL, Wall, South Dakota, bought a Joy model WK-80 315 CFI compressor powered by a Cat D8 1300 diesel for air drilling. The sale was made by Butler-Sparks Equipment Co., Tulsa, Okla.

GEORGE MYERS Construction Co., El Dorado, Kan., has ordered a GM 6240B-RA diesel from the Diesel Equipment Co., Inc., Wichita, Kan., and the unit will be used on an 8-in. sand pump by the construction company.

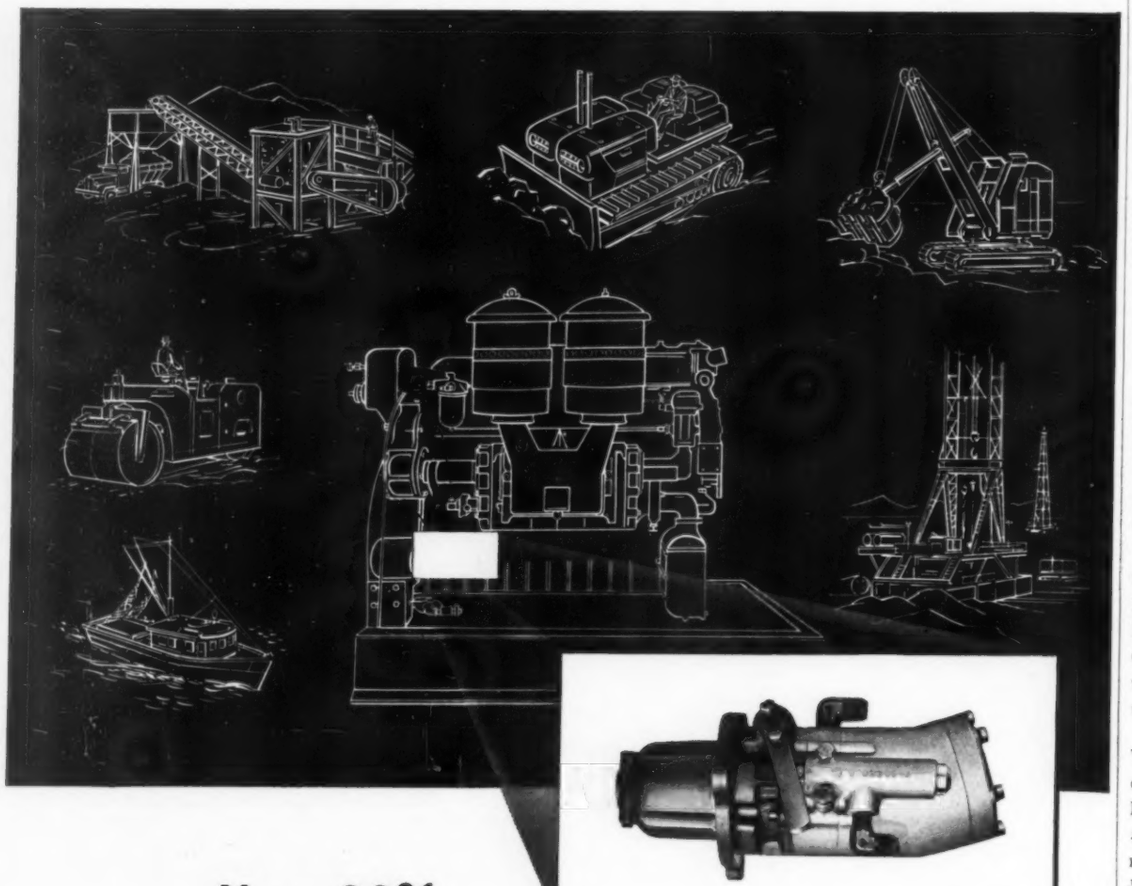
W. D. BURGESS, Tulsa, Okla., purchased three Cat D8 tractors, one Cat DW15 tractor and scraper and two Cat #12 motor graders for use on the toll road construction from the McCormick Machinery Co., Tulsa, Okla.

RAY BROSE, Asphalt Contractor, Woodward, Okla., has bought two S-7 Euclid 7½ yd. scrapers powered by 671 GM diesels. The units to be used for highway work were sold by the Butler-Sparks Equipment Co., Tulsa, Okla.

BELL ENGINE SERVICE, Great Bend, Kan., has received five 6MO-970 and six 6MO-893 Buda natural gas engines for irrigation service in western Kansas from Buda Engine & Equipment Co., Tulsa.

W. D. JEFFRIES Construction Co., Fort Smith, Ark., purchased one Cat DW21 tractor with a 470 scraper and one Cat D8 tractor for use on the toll road, sold by McCormick Machinery Co., Tulsa.

HUNTER CONSTRUCTION CO., Ada, Okla., bought two Euclid 15½ yd. scrapers powered by Cummins NHB, 275 hp, diesels from Butler-Sparks Equipment Co., Tulsa, Okla. The two scrapers will be used on the turnpike.



Now 80% Faster Detroit Diesel Cranking with the new Low-Cost GM Hydrostarter

TESTS PROVE that a Hydrostarter gets a General Motors Detroit Diesel up to starting speeds 80% faster than regular starting systems.

That means fast, sure starts anywhere, anytime—means your GM Detroit Diesel-powered equipment starts *right now* as soon as you pull the starting lever, even at low temperatures or after your equipment has been idle for long periods.

With a Hydrostarter on your GM Detroit Diesel engine, you enjoy thousands of starts without parts replacement, maintenance or downtime expense because all components are self-lubricated and sealed against dirt.

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Multiple Units . . Up to 893 H.P.

America's Largest Builder of Diesel Engines

MIDWESTERN CONSTRUCTORS, Tulsa, Okla., has purchased a Unit 1020A back hoe with a GM 471 diesel as the power plant from Midwestern Engine & Equipment Co., Tulsa, Okla.

POOLE CONSTRUCTION CO., Vinita, Okla., purchased an IH TD-24 tractor with torque converter drive powered by an IH diesel model UD 1091 for work at Vinita on the turnpike. The sale was made by Clarence L. Boyd Co., Tulsa.

ZACK SPEAR AND MARIE SPEAR, Hanna, Okla., each bought a Cat D6 tractor with bulldozer for soil conservation construction from the McCormick Machinery Co., Tulsa, Okla.

HASZ WELL WORKS, Scott City, Kan., has been sold a GM 4045C diesel to power a deep well turbine pump in western Kansas. The engine was sold by Diesel Equipment Co., Inc., Wichita, Kansas.

J. E. COX & SONS, Breckenridge, Tex., operates 35 trucks in the West Texas area doing oil field hauling. Six of the trucks are powered by Cummins NH and HR engines in three Autocar, one Dart and two International trucks.

E. E. BARBER, bridge contractor, working on the turnpike near the Verdigris bridge, purchased a Link-Belt Speeder model LS-98 powered by a Cat D318 diesel from the Butler-Sparks Equipment Co., Tulsa, Okla.

GABBERT-JONES Drilling Co., Wichita, Kan., drilled eight wells in 80 days, including moving and rig-up time, with an Emsco 350 rig powered by two 187 hp Buda PC-1879 gas engines compounded. The rig had a Gardner Denver 7¼ x 14 mud pump.

McMICHAEL CONCRETE CO., Tulsa, Okla., bought one Cat #12 motor grader for street paving projects from McCormick Machinery Co., Tulsa, Okla.

W-G DRILLING CO., El Dorado, Kan., purchased a 600 CFI Joy air compressor powered by an IH model UD-24 diesel. The unit will be used for air drilling and was sold by Butler-Sparks Equipment Co., Tulsa, Okla.

A. K. McBRIDE, Fort Smith, Ark., has sold one Cat D8 tractor for use on the toll road. The sale was made by McCormick Machinery Co., Tulsa, Okla.

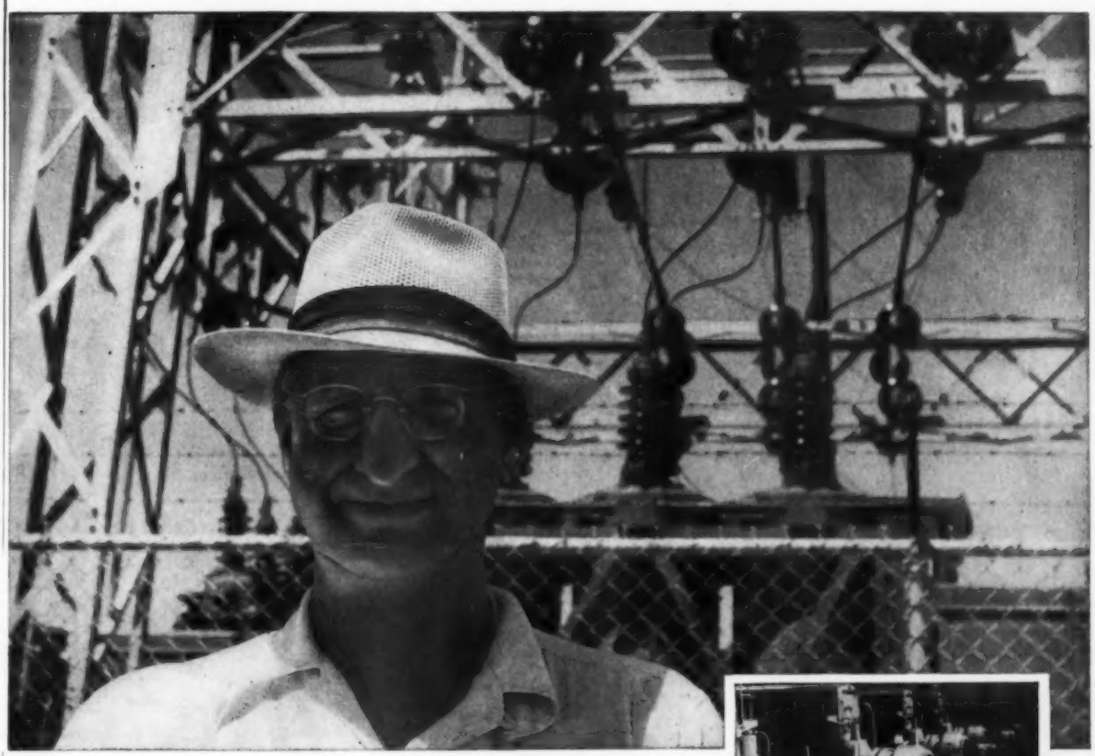
LOGAN & SON CONSTRUCTION Co., Muskogee, Okla., has bought an S-18 Euclid overhung 18 yd. scraper powered by a 6110 GM diesel from the Butler-Sparks Equipment Co., Tulsa, Okla.

Cummins Booklet

What is a Turbodiesel? What are the advantages of turbocharging? How does a turbocharger work? How has turbocharging been applied to Cummins Diesels?

The answers to these and many other questions on turbocharging can be found in an attractive, 16 page four-colored booklet, just released by Cummins Engine Company, Inc., Columbus, Indiana.

Currently Cummins Engine Company is producing five "Turbodiesels," the 175 horsepower JT-6; the 250 horsepower NT-6; the 262 horsepower NTC-6; the 300 horsepower NRT-6; and the 600 horsepower VT-12. Cummins believe this represents the most complete line of turbocharged engines produced by any manufacturer of high-speed, light weight diesel engines today. Cummins Turbodiesels are available for automotive, marine and industrial applications. Copies of this informative booklet may be obtained by writing Cummins Engine Company, Inc. Columbus, Indiana, or by contacting any member of the world wide network of Cummins distributors.



POWERFUL GUY!

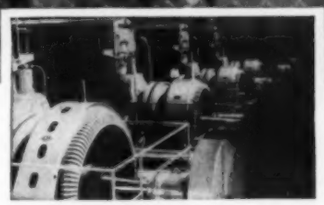
His four Nordberg Diesels, lubricated by Cities Service DC-940 Oil, supply six Oklahoma Counties with REA power. Have one of lowest cost-per-KWH records of entire REA.

His name's H. P. Wingo, and he's Chief Engineer of the REA plant operated by Western Farmers Electric Cooperative.

For the past four years, since his plant began operation in Woodward, Oklahoma, he's been responsible for a consistently high power efficiency rating, measured in cost per kilowatt hour...as high as fifth among all 42 REA plants! To maintain this record, he's had important help... help from four 1100 KW Nordberg dual-fuel engines...and help from Cities Service DC-940 Oil.

"Our engine compressions are the same today as they were after the first three months' operation," says Wingo. "In addition, using Cities Service DC-940, rings have remained absolutely free, liners have worn less than .0015, and we average 14,000 horsepower hours per gallon of oil. Filter elements last up to 1,500 hours."

Wingo has added his words of praise to those of scores of other users of Cities Service Lubricants. Summed up, these reports clearly demonstrate that superior performance is not the exception, but the rule, with Cities Service products. Your Cities Service Lubrication Engineer can readily explain why. Talk it over with him. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

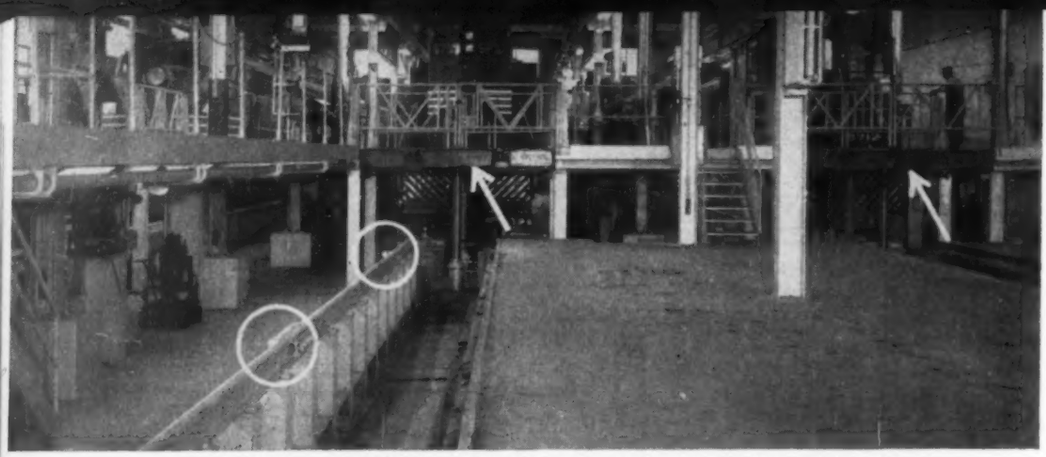


4 NORDBERGS, 4 YEARS OLD...yet engine compression remains the same as after first three months of operation at Western Electric REA Plant, Woodward, Okla. Rings "absolutely free," liners worn less than .0015, oil consumption at 14,000 H.P. hrs. per gallon using Cities Service DC-940 Oil.

CLOSE CHECK is kept on entire operation. Meanwhile, Cities Service Lubrication checks wear in Nordberg engines, helps engineer Wingo maintain record of low cost electricity. Supplying economical power to six Oklahoma Counties, plant's power efficiency rating has been as high as 5th in entire REA.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Overall view of Pittsburgh & Lake Erie railroad diesel locomotive servicing shop at McKees Rock, Pa. Oil drain line along each track conveys crankcase oil to outdoor storage. Circled are Quick-Seal couplings. Arrows indicate piston support platforms.

P. & L. E. SHOP REDUCES SPILLAGE

THE new diesel locomotive servicing shop of the Pittsburgh & Lake Erie Railroad, McKees Rocks, Pa., sets a surprisingly safe, clean "new look" for railroad shops. This is largely the result of a modern lubricant handling system which has almost completely eliminated the usual spillage of oil and grease on shop floors and walls. To a large extent, the success of this system in keeping the shop oil-free, clean and dry is due to a unique quick-connect Titeflex hose coupling. When planning started, it was decided to streamline the handling of lubricants and free the maintenance personnel in the service pit from the hazard and grime presented by spilled lubricants. The plan for doing this was to use pipe lines for conveying lubricants instead of the batch handling method common in older shops. So the two-million-dollar reconstruction included a lubricant-conveying pipe along each rail of the servicing tracks, through which all drained lubricants are pumped to an outdoor storage tank. From this tank the oil is shipped by tank car to an oil reclaiming plant.

This basic idea is simple enough, but its practical success depended largely on some arrangement for connecting the diesel engine crankcase to this drain pipe; such an arrangement would have to be leak-proof, easy to operate, and fast. Furthermore, the servicing tracks can hold as many as five diesel units at once, hence it should be possible to make such a connection at almost any point along the tracks. This was achieved by the following arrangement.

The locomotive's crankcase outlet pipe is connected by hose having a quick-connect coupling on the intake line of a portable pump. The discharge line of the pump is connected, also by hose with quick-connect coupling, to the drain line alongside each rail. Couplings are installed at several points.

This "plugged-in-pump" arrangement for conveying the lubricant through the line was preferred over several other considered methods, for these reasons: 1. Gravity feed was not practical, because the drained oil had to be elevated into the storage tanks having a pressure head of three or four feet. 2. A permanently connected pump, near the storage tanks, would have to draw the drained oil by suction from any point along all three servicing tracks. This would comprise such a big suction load that a huge, costly pump would be required to handle it. But a small, portable pump, hooked-in right at the locomotive, would provide the small pressure needed for positive delivery of the drained lubricant from anywhere along the servicing track into the outdoor storage tanks.

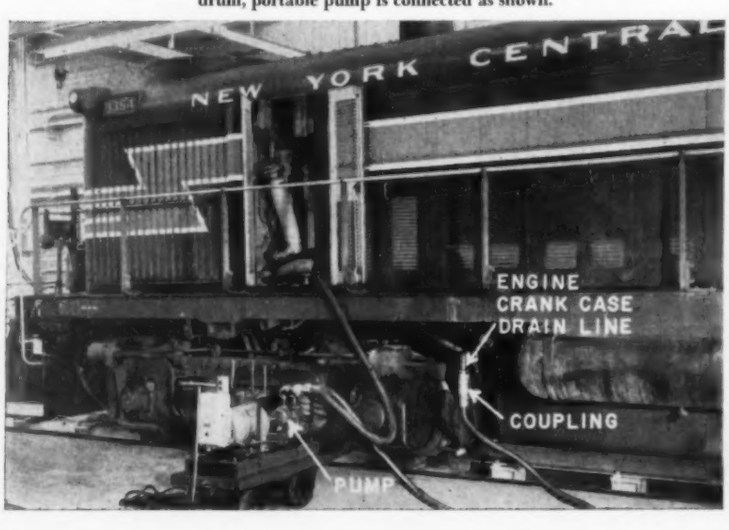
Using a portable pump provides pumping action wherever needed along the servicing track, and all drained oil is always confined within a pipe. But the practical success of this scheme depends largely on a quick-connect hose coupling that meets the service requirements. Of several types considered, the Titeflex Quick-Seal design was selected. In this coupling, the seal is a packing ring against which the end of the nipple sets solidly as soon as the coupling is connected. As pressure builds up in the line, it expands the lips of the ring, making the seal tighter the higher the pressure. Being inside the coupling, the seal does not wear in the course of normal handling, hence the coupling remains leak-proof. And should it be necessary to replace a seal, the old one is pulled out with long nose pliers and a new one snapped into its place.

This coupling also is made in a built-in check valve form which retains all the basic characteristics of the design. That is, it is leak-proof, full swiveling, and has fast connecting and disconnecting action. Such a check valve automatically snaps closed the instant the coupling is disconnected. Therefore any oil remaining in the line cannot leak out when the line is opened. The Quick-Seal couplings throughout this P. & L. E. shop are all of this check valve type. Thus the other major source of oil leakage—oil drainage from disconnected lines—is practically eliminated.

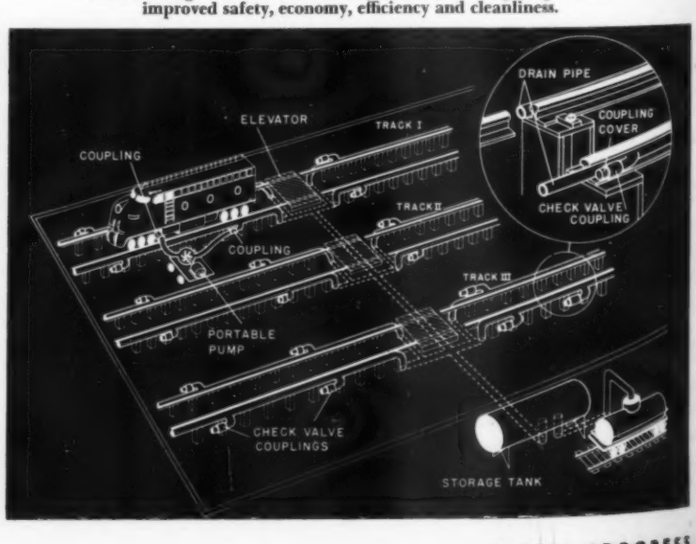
This shop has another lubricant handling problem for which the Quick-Seal coupling provides a time and labor saving solution. In diesel locomotives, the lubricant circulating pump is directly connected to the diesel engine. Hence an external pump must be used to force lubricant to all the bearings before an overhauled engine is started up. The plug-in portable pump with Quick-Seal couplings used for pumping drained crankcase oil also does this pre-lubrication job.

These couplings get plenty of use as this shop services and maintains diesel locomotives designed for all kinds of service, and there are from eight to twelve locomotives on the tracks per month undergoing oil changes. Yet in the year and a half of such usage these couplings have met service requirements without failure.

Pre-lubrication of diesel engine after overhaul is in progress. When lubricating oil is supplied from crankcase instead of an oil drum, portable pump is connected as shown.



Schematic diagram of the crankcase oil drain piping system in the Pittsburgh & Lake Erie railway's diesel servicing shop. It has improved safety, economy, efficiency and cleanliness.



Mid-West Diesel Notes

By L. H. Houck

KENTUCKY STATE Highway Department plans the purchase of about $1 million worth of new road equipment and heavy machinery to replace worn and outmoded items, according to W. T. Rye, deputy highway commissioner.

W. O. HOMER, Junction City, Kansas, operates a portable rock crushing plant powered with a Murphy diesel. Heavy demand from highway contractors has taxed the capacity and he is turning out 150 tons per hour. He feeds his crusher with a Northwest shovel also powered with a Murphy diesel.

HOOVER MOTOR Express, Nashville, has taken delivery on 70 new trucks and has 30 more on order in a $2¼ million expansion. All trucks are Mack, with Mack EN-373, 175 hp diesels.

RED D Mix Concrete Co., Kansas City, has added 20 new GMC tandem trucks with 6-71 GM, 190 hp diesels, carrying 5½ cu. yd. transit mixers. The company is currently supplying 1500 to 2000 cu. yds. of concrete daily to K. C. construction jobs.

ARKANSAS Highway Department has bought on low bid of $35,727.21 from Little Rock Road Machinery Co., three crawler tractors, International-Harvester, TD-14A, with hydraulic dozer blades.

LITTLE ROCK Road Machinery Co., was low bidder on 18 Galion No. 118 heavy duty graders at $183,770 and 16 medium-duty Galion graders No. 104 at $150,560, all equipped with International diesels for use by Arkansas Highway Department.

R. E. COMMON Equipment Co., Peoria, Ill., is a new Austin-Western distributor for that area.

MO. STATE Highway Department has taken delivery on an Allis-Chalmers AD-30 grader with a 3-71 GM diesel, from Fulton branch of Riney-Ryan Tractor Co.

GARDNER-DENVER tractor jumbo rock drill with rear-mounted direct-connected air compressor and two hydraulic booms handling a pair of drifters with 12-ft. towers, all mounted on a Cat D8, was one of the main rigs used by Porter-DeWitt Construction Co., in half million cu. yds. of rock excavation on U. S. 66 between St. Louis and Lebanon.

FOSTER FREIGHT LINES, Indianapolis, has added 24 diesel-driven trucks to its fleet—Whites with JT-6 Cummins.

OGP Division Annual Meeting Set

Reservations for exhibit space at the Oil and Gas Power Division meeting in New Orleans is reportedly being taken at an increased pace. R. A. Schakel, who is now accepting reservations, suggests that anyone intending to exhibit make the necessary arrangements with a minimum of delay. Write to him at the Diamond Chain Company, Inc., 407 Kentucky Ave., Indianapolis 7, Indiana.

Scheduled for April 3-6, 1956 at the Jung Hotel in New Orleans this annual event has become an important occasion for the exchange of new ideas and developments in the field. It will draw into New Orleans operating engineers from shipping, pipe lines, oil drilling and kindred industries using oil and gas power in their operations. They are the people who select engines, auxiliaries and accessory equipment for their companies. It is expected that responsible personnel from Mexican and South American areas will also be present. The theme of the meeting will be "Marine and Pipeline, Oil and Gas Power."

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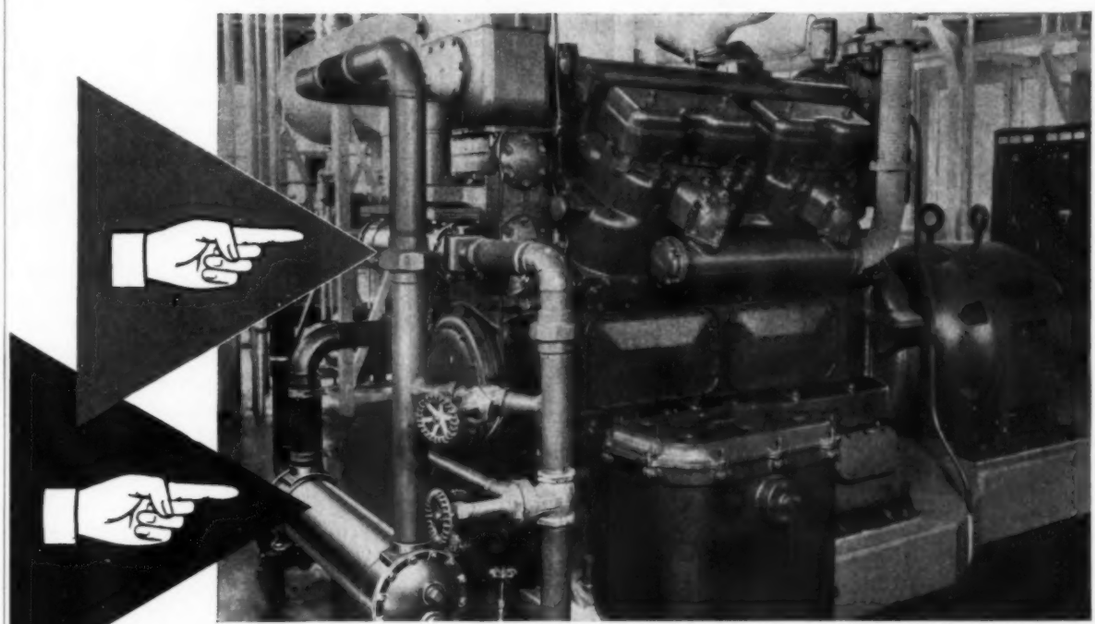

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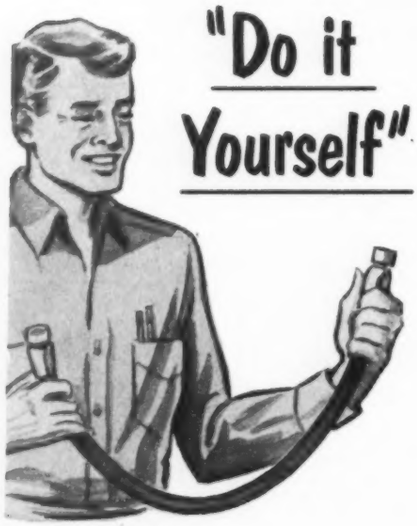

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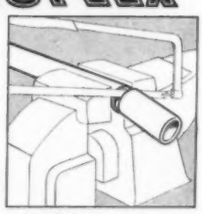
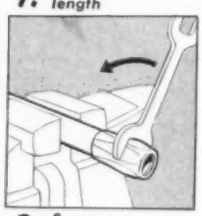
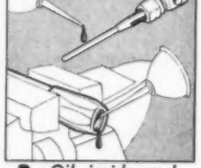


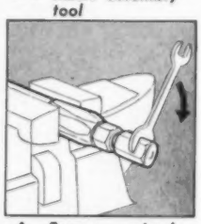
1. Cut hose to length



2. Screw on socket



3. Oil inside and insert assembly tool



4. Screw swivel nipple or male fitting into socket and remove tool

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European Diesel News

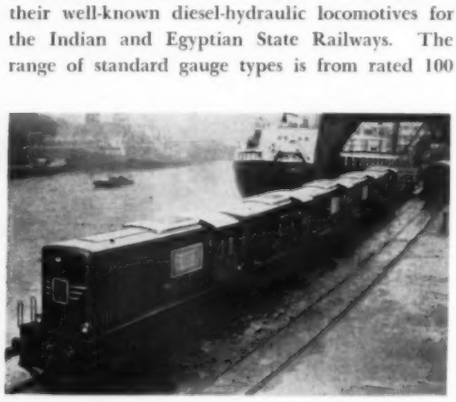
By Leo Walter

THE Swedish tanker *Hoegh Sword* is said to be the first ship built in a Swedish shipyard to be equipped with a turbocharged two-stroke diesel engine. The vessel (owned by the Norwegian shipping concern A/S Leif Hoegh) and the six-cylinder engine were built by the Eriksberg Mechaniska Verkstadt A.B., Goetheborg, Sweden. Developing 7400 hp at 115 rpm, the engine has a Brown-Boveri turbo pressure charger which increases the normal output by about 35% and dispenses with scavenge pumps.

Linke-Hoffman-Busch A.G. of Salzgitter, Germany has supplied diesel-hydraulic twin-car trains to the order of the Mexican SCOP administration. They were built in 1954, are of the lightweight quick-running type and each develops 900 bhp for traction. Mekydro transmission gears have been used. On each bogie is carried a Maybach MD 320 naturally aspired vertical engine, giving 450 bhp at 1700 rpm. The trains were put to work on the F.C. del Sure Estate line running from Mexico City to Vera Cruz.

Finland has placed a repeat order with Leyland Motors Co. Ltd., valued at nearly £2½ millions for diesels to be fitted into Finnish-built vehicles. The engines are vertical Leyland models of both 350 cu. in. and 680 cu. in. capacity.

Messrs. Arno Jung Lokomotivfabrik G.M.B.H. of Jungenthal, Germany have supplied a number of their well-known diesel-hydraulic locomotives for the Indian and Egyptian State Railways. The range of standard gauge types is from rated 100

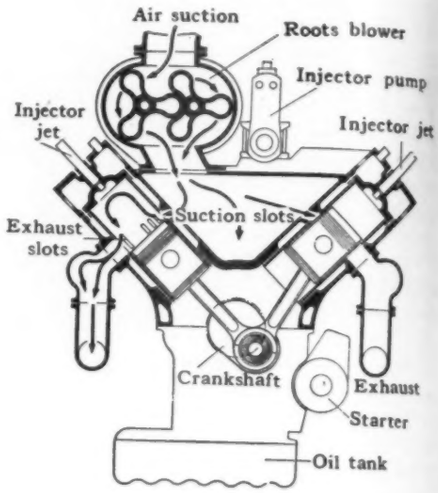


hp to 2000 hp, and similar sizes are available for narrow gauges. Diesel-mechanical types, 4-wheeled with chain drive, for 1435-1675 mm gauges are also manufactured. Voith type transmission and engines made by Motorenwerke Mannheim are, for example, incorporated in their diesel-hydraulic type LC 24 B + B.

Greek shipping interests have placed orders for 21 diesel-driven dry cargo ships with Dutch shipyards. The contracts are worth about £21 millions and each vessel will have 14,260 tons.

Yugoslavia has ordered from H.Widdop & Co. Ltd., Keighley, England a diesel engine type GMB6 for inclusion into a suction dredger for a large irrigation scheme. The engine delivers 400 hp through a clutch to the propeller, and 600 hp to the dredge pump via a special clutch arranged to disengage automatically under overload.

The Austrian firm of Graf & Stift A.G. of Vienna have developed a new valveless two-cycle diesel engine, in collaboration with the Institute of Prof. List in Graz, Styria, Austria. Two types are manufactured: a 125 and a 180 hp engine, to be used



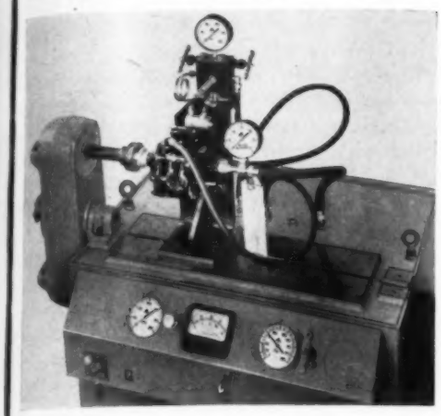
for buses and trucks. The 125 hp engine is being constructed entirely of light metal to serve as a propulsion unit of a Graf & Stift lightweight bus.

A diesel-electric tug, specially constructed for the towing of large ocean-going vessels in the Western Rotterdam harbor in Holland, has been built by N.V. Scheepswerven for L. Smith & Co. A 6-cylinder M. A. N. diesel developing 600 hp drives the generator. The vessel is called the *Argus*, and a sister ship *Atlas* will be commissioned this year, to be followed by two additional vessels.

From the early days of Sulzer Bros. of Winterthur, Switzerland: Swiss diesel engine patent rights taken out in 1893. . . . . First Sulzer stationary engine of 20 hp completed May 1898. . . . First ship propulsion unit of 40 bhp installed in 1904. . . . First direct reversible two-stroke marine engine of 90 bhp built 1905. . . . First diesel locomotive with a Sulzer engine of 1000 bhp built 1912. . . . In contrast: Three double-acting two-stroke Sulzer engines of 7500 bhp each operate today at the Kubel diesel-electric power station in Switzerland. The Societe Industrielle Generale de Mecanique Appliquee of Paris, France report that on March 31, 1955, 46 free-piston gas generator turbine sets comprising 10 gas-generators developing altogether 102,000 shp were in service or in course of construction. Sets in regular service totalled 80,000 running hours. SIGMA sets include electrical generating units, sets for railway traction, propulsion sets for the French Navy and for the French Merchant Marine, pumping and miscellaneous sets.

THE ITALIAN works at Turin of Messrs. Fiat has tested a six-cylinder industrial diesel rated 3250 kw at 120 rpm, using two Brown-Boveri turbochargers. Impulse and constant-pressure systems have both been used, but according to Mr. R. de Pieri's comments at the Hague Conference, they prefer the latter system, despite slightly higher fuel consumption rate due to the work done by the scavenge pump. Five percent lower fuel consumption has been found to occur than that of the normal aspirated engine.

Calibrating Stand for Cummins "PT" Pump

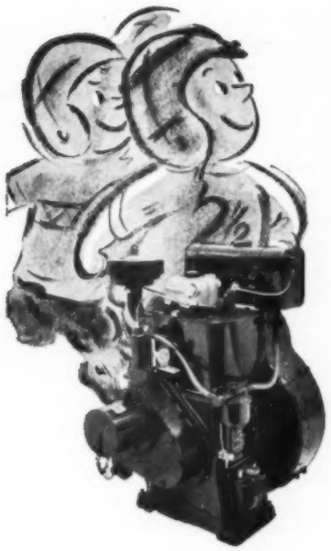


A diesel pump calibrating stand designed specifically for testing the new Cummins PT pump has been introduced by Bacharach Industrial Instrument Co., 7301 Penn Avenue, Pittsburgh, Pa. It is equipped with a 3-hp motor, variable speed drive to simulate all pump speeds from 150 to 4000 rpm, motor-driven fuel supply pump, and a full complement of instruments for measuring rpm, pump strokes, fuel oil temperatures and pressures. Fuel oil heating equipment is available optionally. The stand comes with a complete set of accessories comprising mounting bracket, drive coupling, fuel delivery lines, measuring graduate, etc. for testing and calibrating PT pumps in accordance with the procedure recommended by the manufacturer. Designing the stand for this specific application has resulted in a price substantially lower than the price of the company's universal fuel pump calibrating stand which is suitable for testing Bosch, Caterpillar, International Harvester and Cummins single and double disc pumps, as well as the PT pump. (ITS NEW)

Named President

J. N. Fitzgerald

In a special meeting of the board of directors of the Warner Lewis Company on September 12, 1955, J. N. Fitzgerald was promoted to president of the company. At this same meeting, the board accepted the resignation of Mr. Warner Lewis as president and elected him chairman of the board and Mr. Steven B. Wilson was elected honorary chairman. Mr. Fitzgerald joined the Warner Lewis Company in 1948, as its Washington representative and remained in that capacity as a vice president of the company until January 1, 1954. At that time, the Warner Lewis Company was acquired by the Fram Corporation of Providence, Rhode Island, as a wholly owned subsidiary. Mr. Fitzgerald was moved to Tulsa, at that time, as executive vice president for this subsidiary. On Feb. 1, 1955, he was transferred to the Washington, D.C. office of the Fram Corporation, where he served as vice president in charge of sales for Warner Lewis Company, Division of Fram Corporation until his promotion to president of the company.



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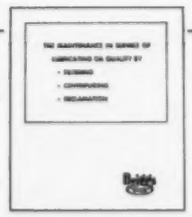

Straws in Today's Business News

"THE INTELLIGENT development of automation in industry will result in giving the average worker a 30-hour work week within the next five to ten years, with no reduction in pay or standard of living," Dr. Arnold O. Beckman, president of Beckman Instruments, Inc., told a recent convention of the Instrument Society of America. The trend he heralds is of great significance to the diesel industry. It means that an increasing number of engines will be installed so that they will start and stop automatically and run for days, unattended. Automatic controls already are considered an essential part of a large percentage of the stationary installations made. This practice has grown as more and more emergency diesel generating and pumping units are being installed in public utility plants, hospitals, commercial and industrial buildings. Manufacturers of engines, accessories and dieselized equipment can see expanding sales opportunities in these trends. . . . Dr. Beckman defined the field of automation as follows: "We should differentiate between mechanization and automation. Mechanization replaces or amplifies human brawn. Automation supplements the human brain. When you automate a manufacturing process, you include what we call feed-back or self-correction. The common room thermostat automatically controls the operation of your gas furnace, for instance, to compensate for changes in room temperature. This is automation."

FURTHER ENCOURAGEMENT to manufacturers was offered at the same convention by Robert T. Sheen, president of the Instrument Society. He said, in part: "If our standard of living is to increase at its present rate, machines will have to be put to work where machines now do not exist. New, more versatile equipment will have to be created and built. This is not the only justification for control instruments and automation. We, the customers for industry, always look for better quality in the products we buy. We want this quality at the lowest possible price. In the face of these buying demands and in the light of the keen competition that exists between manufacturers for the market, any company must consider automation or fall by the wayside. Management must recognize that automation embraces all functions of the business and not just the techniques of manufacturing." . . . Mr. Sheen also said: "Statistics reveal that of the total work force in 1935, 17% was engaged in manufacturing. In 1953, despite the tremendous increase in plant instrumentation that has taken place, the percentage of total work force engaged in manufacturing had increased to 25%. In 1964, therefore, one of the greatest shortages in our country may be in manpower. Conservative estimates indicate that 184,000,000 Americans will want 40% more goods than is consumed today, yet the total work force to produce these goods will increase less than 13%. Instrumentation and automation hold promise as to the most practical and desirable solutions to this anticipated labor shortage."

AT ANOTHER RECENT conference, the World Symposium on Applied Solar Energy, the challenges of newer types of power were placed in their proper perspective by Farrington Daniels, a University of Wisconsin scientist. He said: "There is no sudden era of solar prosperity just around the corner, but I believe that by a judicious combination of fossil fuels (coal, oil, gas), atomic energy, and solar energy, the whole world can have within this century all the mechanical power and the material comforts that it wants."

THE MARITIME ADMINISTRATION has launched an experimental program designed to discover the most effective type of power to upgrade American Merchant Marine vessels built for World War II service. These obsolete vessels were powered by reciprocating steam engines which deliver 2500 shp at a top speed of 10 knots. The idea is to boost the power to 6000 shp and speed to 15 knots or more. A Liberty ship, withdrawn from the "moth ball fleet" by the Newport News Shipbuilding & Dry Dock Co., will be repowered with an experimental marine gas turbine built by General Electric. Other types of power to be tested include a conventional steam turbine, a geared diesel engine, and a free piston gas generator-turbine. In connection with the latter type of power, it is generally known within the diesel industry that three major engine manufacturers have been developing free piston engines over a period of years without having announced a unit suitable for marketing.

ALFRED A. STRELSIN, chairman of the group which recently gained control of McWilliams Dredging Co., has been reported in the press as seeking to purchase a diesel engine manufacturing concern as well as offshore drilling companies and a heavy pipe manufacturing firm.

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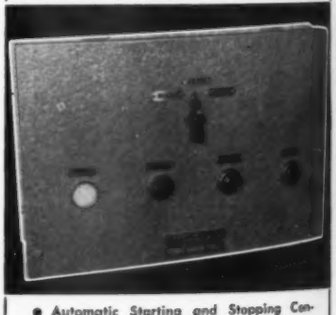

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Marine Engine Package

Engineers at Caterpillar Tractor Co. and Twin Disc Clutch Company have jointly designed and developed a new line of marine reverse and reduction gears built exactly to match Cat marine engines. This new Caterpillar marine gear has been built to equal the life of the engine for which it is matched. All bearings for this new gear, were selected for long life under unusually severe operation.

Finger-tip control of the new Cat marine gear, which is hydraulically operated, permits fast operation and easy maneuvering. This was one of the features most liked by boat crews who tested the new gear during intensive field trials. The new gears will make the marine engine package more compact, requiring less length for installation. Equipped with the new gear, the Cat D337 (Series F) marine engine is 15 inches shorter than the former D337. This new compactness was achieved by mounting the two clutches side by side rather than tandem.

The gear has been designed and built for continuous operation at full load—in either direction. This means that one model gear can handle both right and left hand propellers, and boats with multiple engines can use identical gears.

International Combustion Engine Congress

The Permanent Committee of the International Combustion Engine Congress, whose headquarters are at 10 Avenue Hoche, Paris recently agreed on the general lines which will be followed at the Congress to take place in 1957 in Zurich, Switzerland. This will be the fourth Congress, previous one having been held in Paris in 1951, Milan in 1953 and The Hague in 1955. The success of these gatherings surpassed all expectations, to the extent that at The Hague the Committee was reluctantly obliged to refuse subscriptions which arrived late.

Interest in the Combustion Engine Congress lies in its taking the form of a discussion followed by technical visits. This procedure will again be followed in 1957, with the following theme: "Pressure charged diesel engines and gas turbines in their different classes - Marine, Traction and large size generating equipment (Research, Results & Future)."

On the agreement of its members, the Permanent Committee has delegated to Switzerland the organization of the next Congress during the second half of June, 1957. The meetings and visits to factories will extend over one week. Details will be given later.

In view of the importance and interest of the theme of this Congress it is anticipated that applications to present papers will be numerous. Having regard to the limited number of papers which can be retained for discussion during the Congress (from 20 to 24), the Permanent Committee invites those desiring to present a paper, either in their own name or in the name of their Company, to let their National Committee know before the 15th February next, or failing this, inform the Permanent Committee in Paris, giving the following particulars: 1. Their name, position, references regarding their chosen subject. 2. The title of their paper, accompanied not only with a simple resume but also by a plan or analytical expose not exceeding two typed pages, complete with list of probable figures graphs and tables to be attached, which will permit of an opinion being formed of the interest it is likely to arouse within the framework of the chosen theme.

Authors of papers whose applications are retained will be so advised in March 1956, and will be sent at the same time all necessary instructions for drawing up their final papers.

NO MAJOR ENGINE REPAIRS IN OVER 2 YEARS' SERVICE ...THANKS TO DE LAVAL "PURI-FILTERS"!

The Shipowners & Merchants Towboat Co., Ltd. of San Francisco (Red Stack Line) has two sea-going diesel engine tugs on which De Laval "Puri-Filters" have been in service for over two years.

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This is a typical example of De Laval "Puri-Filter" service. There simply is no better, safer way to keep diesel lube oil both *clean* and *dry*—as proved by the experience of hundreds of diesel-powered generating stations and vessels. Get *all* the facts—write today for the new De Laval "Puri-Filter" Bulletin.

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Florida Diesel News

By Ed Dennis

THE *M V AZUSA* of Panama R. P., owned by the Eastern Shipping Co., had two General Motors 4-71 diesel engines installed to furnish power for the ship's ammonia refrigeration plant. Engines were supplied by the Miami branch of Florida Diesel Engine Sales.

UP AT Macon, Ga., the Southern Stages recently purchased a 175-hp Model JT6B Cummins diesel, to be installed in an Aerocoach bus, from Cummins Diesel of Georgia.

ATLAS Consolidated Engineering Co., Miami, just completed a new portable dredge for Belcher Oil Co. Powered with two GM 6-71 diesels plus another GM diesel for the auxiliary light plant, it was built in eight weeks.

THE newly launched *Mr. Andy* did 14 knots in Biscayne Bay on her trial runs. This 38-ft. fishing vessel is powered with a model DIXEC 6-cylinder Hercules diesel rated 115 hp at 3000 rpm, — supplied by Auto Marine Engineers of Miami.

AT FLORIDA CITY, Michael Ryechesh took delivery of a Model D315 Caterpillar diesel directly connected to a C. M. C. Rainmaster 6-in. pump. Both are mounted on a trailer for use in avacado and mango groves.

THE General Engine & Equipment Co., Tampa, announces the appointment of D. C. Dyble as a sales representative for the firm. Mr. Dyble is a graduate of University of Houston and served in the U. S. Navy during World War II.

CUMMINS Diesel Engines supplied the Model NHB-600 diesel for a Mack truck for Elton Miller of Jacksonville; a Model HRBB-600 in a Diamond T for Florida Co. of Quincy; and N&B Truck Rentals took delivery of a Mack with an NHB-600 Cummins diesel.

FLORIDA Diesel Engine Sales, Miami, repowered from a gasoline engine the lobster boat *Valrita* with a GM 4-51 diesel and a 2:1 Paragon reverse and reduction gears for Val Thomas.

AT ST. AUGUSTINE, the Diesel Engine Sales launched the 53-ft. *Miss Chryl* for the Cook Fish Co., Panama City, powered with a GM 6-71 with an Allison 4.5:1 reverse and reduction gear and a GM power take-off.

HOLY CROSS Hospital in Ft. Lauderdale received a Model D375 Caterpillar diesel generating set for emergency use. Also included was a Columbia 260-kva generator and a 10-kw Onan diesel generating set from Shelley Tractor & Equipment Co. of Miami.

THE J. L. SKINNER Groves at Dunedia received two Speed sprayers, each powered with a General Motors Model 43301, rated 54 hp at 2200 rpm from General Engine & Equipment Co.

GASPARILLA Fisheries at Placida built and will operate the newly launched *Gasparilla II*, a 58x20-ft. Caterpillar-powered fishing vessel. The Model D13000 Cat is rated 120 hp.

AT BROOKSVILLE, the General Portland Cement Co. received a Model NHRBIS Cummins, rated 300 hp for use in a Tournapull, while the Camp Concrete Rock Co. took delivery of two Model NHRIS 300-hp Cummins engines for Euclid scrapers.

THE *VANCO*, a Chris-Craft cabin cruiser built especially for ex-king Farouk I of Egypt, but never delivered, was recently repowered from gasoline engines to two General Motors 671 diesels by Florida Diesel Engine Sales of Miami.

NOW! One Tester for ALL GM Diesel Injectors!

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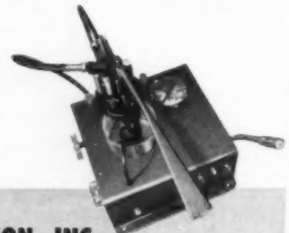
Yes, now for the first time you can check *all* GM Diesel Injectors on *one* tester! That's right. The six tests specified for all Series 51, 71 and 110 engine injectors can be performed quickly and easily on the new Kent-Moore Injector Tester . . . and there are no special conversion units or individual holding fixtures to bother with either! Consider, too, some of the Tester's other outstanding features . . . a clear view plastic container that permits safe, unobstructed observation of the spray pattern . . . a positive lock, fine-adjustment popping handle for greater accuracy in checking leaks at pressures higher than the normal valve opening pressure of the injector . . . a fine mesh screen and ten-micron filter to guard against fuel system contamination . . . a sturdy 3,000 pound gauge with "lazy" hand for faster testing . . . oil resistant hoses and nylon-sealed connector fittings to insure long tool life. All these features, and many more, make it easy to see why the Kent-Moore Injector Tester is specified in your maintenance manuals. Order yours today!

The complete J 7000 Injector Tester, as illustrated at right, includes the basic testing instrument, J 5764, plus three adapter sets . . . J 7051-1, J 7071-1, J 7110-1 for testing Series 51, 71 and 110 injectors respectively. The adapters are offered separately for purchase in any combination desired. For complete information, write Kent-Moore direct today!



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People who sell, people who buy, people who use diesel engines need this new, fully illustrated, up-to-the-minute volume. It has been completely revised and expanded. Orders are now being accepted for this latest edition. Price $10.00 prepaid.

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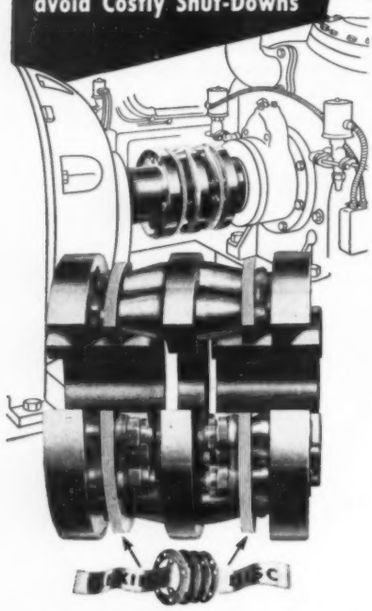

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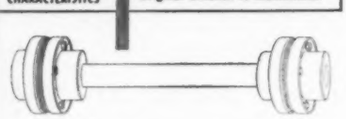

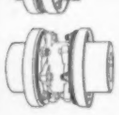

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Elected Vice-President

R. F. Lay

By the action of its board of directors, Robert F. Lay has been elected to the position of vice president and general sales manager. This announcement has been made by Stanley E. Johnson, vice president and director—Sales of The Cooper-Bessemer Corp., Mount Vernon, Ohio. The election of Mr. Lay as an officer of the company landmarks a period of brilliant service as general sales manager for the company products including engine-driven and motor-driven compressors, gas engines, diesel engines and gas-diesel engines, Mr. Johnson points out.

Vibration Measurement

A new publication, "Measurement of Vibration," has been made available by the General Radio Company. This booklet, consisting of 64 pages, covers the meaning of vibration terms, description of vibration-measuring instruments, procedures, typical examples, and interpretation of results. A short section is devoted to the human response to mechanical vibration.

Unwanted vibration, like noise, plagues nearly every industry and plant at one time or another. It is also true that there are many types of desirable vibrations. The first step toward understanding what is happening in all these cases is the measurement of the vibration, and a useful guide for this work is the "Measurement of Vibration". Copies are available from the General Radio Company, 275 Massachusetts Avenue, Cambridge 39, Massachusetts. ITS NEW

Tank Contents Indicator

A new remote reading tank contents indicator especially designed for applications where panel space is limited has been announced by The Liquidometer Corporation, Long Island City, New York. The indicator is known as Model 216. A dial type instrument, it has a scale length of 20 inches although occupying a panel space of only 3 x 10¼ inches. It is available for either horizontal or vertical panel mounting.

The gauging system consists of an indicator and a float type tank unit interconnected by a flexible conduit containing two hydraulic capillary tubes. The indicator may be located as far as 250 feet from the tank unit. A completely self-contained hydraulic system provides indicator actuation. No outside power is required.

Where level control is required in conjunction with tank contents measurements, Underwriters approved switches are furnished. The tank unit is installed through a single 2-in. diameter opening in the tank. Once installed, the system requires no further maintenance. Further information concerning Model 216 Indicator may be had by writing for Liquidometer Bulletin 532. ITS NEW

General Sales Manager

Robert E. Hunter

Appointment of Robert E. Hunter as general sales manager of the Detroit Diesel Engine Division of General Motors was announced by Semon E. Knudsen, general manager of the Division. Until this appointment, Mr. Hunter has been director of sales of General Motors Diesel Limited of Canada. Mr. Hunter, who was born in New York in 1911, graduated in engineering from the University of Michigan in 1934. He first joined General Motors in 1937 as business management manager at the Pontiac Motor Division. He transferred to the Electro-Motive Division of General Motors as assistant director of industrial relations. He later became manager of the market analysis and statistical section and then district sales manager in Chicago. In 1949 he joined General Motors Diesel Limited of Canada. Mr. Hunter, who is married and has four sons, will live in Ann Arbor.

Joins Hall-Scott

Robert Swan

Robert Swan has joined the sales organization of Hall-Scott Motors Co., Berkeley, Calif., according to an announcement by A. G. Baxter, sales manager. For the last five years Mr. Swan has been district sales manager for Aero-Coupling Corp., and previously was with West Coast Engine & Equipment Company, Berkeley.

Acquires Manufacturing Facility

Ladish Co., Cudahy, Wis., manufacturer of drop forgings, pipe fittings and rolled rings, has announced the purchase of two adjacent Los Angeles manufacturing plants: CBS Steel and Forge Co. and General Pacific Corp. They will operate as the Ladish Pacific Division, Ladish Co.

Broad improvements in methods, equipment and quality controls are being instituted to bring to West Coast fitting and forging buyers new standards of manufacturing uniformity and metallurgical integrity, according to J. L. Varga who was brought from successful establishment and development of Ladish Co. of Canada Ltd., to manage the new plant. H. L. Pehrson, district manager of West Coast Fittings Sales; G. L. Shaffer and H. Stroup, special sales representatives, along with other staff members have moved to offices at the plant. Other Ladish sales offices on the West Coast are maintained in San Francisco and Seattle and are under the direction of A. C. Tracy and W. W. Warren respectively.

Manager of Advertising

Henry J. Barbour

Robert H. Morse, Jr., president, Fairbanks, Morse & Co., has announced the appointment of Henry J. Barbour as manager of advertising and Public Relations for the company. He succeeds L. A. Harlow who has resigned to join an advertising agency. Mr. Barbour has been associated with Fairbanks, Morse & Co. for thirty-one years having held numerous positions both in the firm's Beloit, Wisconsin, works and the executive offices in Chicago.

Pacific Coast Manager

James W. Reed

James W. Reed, vice president of Cooper-Bessemer has been appointed Pacific coast manager, in charge of the company's offices located in Los Angeles, San Francisco and Seattle. John Rogers, who occupied this position for the past fifteen years has been appointed special representative and consultant. These changes, have recently been made public by Stanley E. Johnson, vice president and director of Sales for The Cooper-Bessemer Corporation at Mount Vernon, Ohio. Mr. Reed, a vice president of the company since 1947, has been New York district manager of compressor and stationary engine sales since 1940. Joining the company in 1922, he opened the company's first Pacific Coast office in Los Angeles in 1925, remaining there until being transferred to New York.

Repowers Ditch Digger

Shelley Tractor & Equipment Co. of Miami recently repowered a ditch digger owned by Joe Reinertson, contractor of Miami and Jacksonville, Florida. Repowered from a gasoline engine to a Caterpillar D13000 diesel engine, the contractors expect another 20 years of use for the machine.

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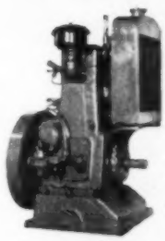


MODEL "ADRS"

WITTE VERTICAL ENGINES

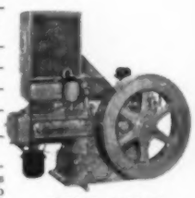
MODELS	CONT. H.P.	COOLING	MAX. RPM
"ADTS"	4.0	Tank	1200
"ADRS"	3.75*	Radiator	1200
"LDTS"	9	Tank	1350
"LDRS"	8.6*	Radiator	1350

*Lower rating due to power required to operate fan. Units can be equipped with stub shaft or clutch power take-off.

WITTE HORIZONTAL ENGINES

MODELS	CONT. H.P.	COOLING	MAX. RPM
"BDTS"	8	Tank	900
"BDRC"	7.8*	Condenser	900
"CDTS"	12.5	Tank	750
"CDRS"	12.2*	Condenser	750

*Lower rating due to power required to operate fan. Units can be equipped with stub shaft or clutch power take-off.



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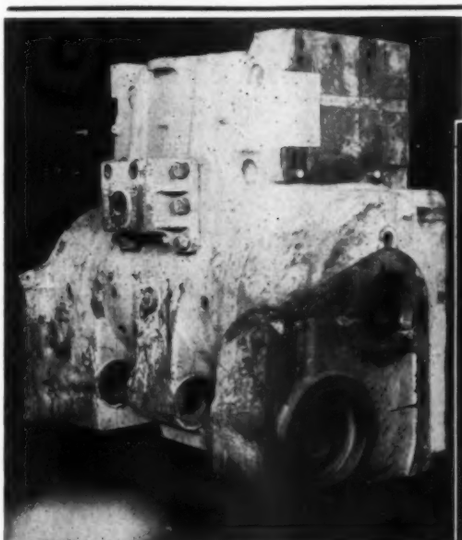

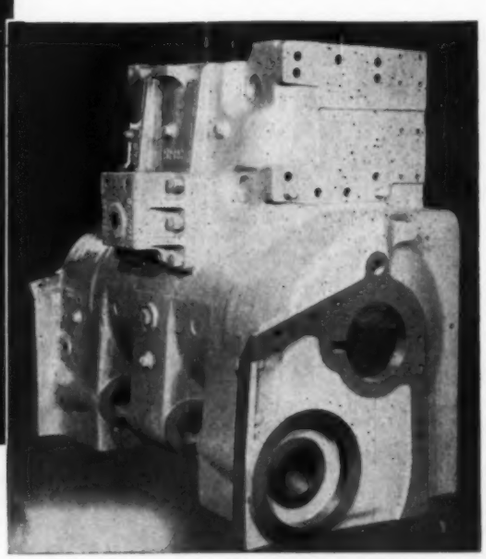

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A design engineer writes about DIESEL ENGINE CATALOG, Volume 20 . . . "It has the attractive make-up and complete presentation for which it has been known and which makes it an excellent source of information."

An accessory manufacturer writes . . . "The model identifications of the various diesel engines will be valuable to us in our efforts to accumulate engine torque specifications."

A top filtration expert writes . . . ". . . have been through DIESEL ENGINE CATALOG, Volume 20, from cover to cover and can only say I would not think it was possible to make so many improvements over the last issue. It is a magnificent job and I know it will be used frequently by me."

DIESEL ENGINE CATALOG

Volume Twenty

DIESEL ENGINE CATALOG can serve you too as it is serving thousands of diesel men. Whether you buy, sell, repair or service diesel, dual-fuel or gas engines, you need DIESEL ENGINE CATALOG, Volume 20.

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Patrol Craft

Now enforcing commercial and sport fishing regulations on Washington coastal waters is this new dieselized patrol boat recently acquired by the Washington State Department of Fisheries. Designed by Edwin Monk, Seattle naval architect, the craft is 36 feet in overall length and has a beam of 11 feet. She is powered by a General Motors 4-71 diesel engine turning a 24-in. x 22-in. wheel. Estimated top speed is 12 knots.

Overnight accomodations are taken care of by a stateroom forward and a pilot house which combines operating station with galley and dinette. The craft has a Northern radio telephone Wood automatic pilot, Emerson loran unit, RCA FM receiver and transmitter and a Bendix depth recorder. She is to be operated the year around with her home port at Westport, Washington.

Rubber-Tired Dozer

The Construction Machinery Division of Clark Equipment Co. has introduced a new rubber-tired dozer with a road speed of 27 mph, four-wheel drive, and rear-wheel steering. Named the Michigan Model 180 Turbo-Dozer, it is powered by a turbocharged Waukesha diesel rated 165 hp. At the same time, Clark officials also announced a 15-cu-yd.-capacity tractor shovel, designated the Model 12B. It is powered by a 42-hp Waukesha diesel of 144 cu. in. displacement.

Both new units in the Clark line are equipped with Clark-built torque converters. These units automatically provide up to 3-to-1 torque multiplication and planetary wheel drive axles. On both machines, a Donaldson air filter is used. On the Turbo-Dozer, the secondary fuel filter is a Fram and the final fuel filter is Bosch. Both fuel filters on the 12B are Frams, and both machines use Fram lube oil filters.

The Turbo-Dozer's 2¾-yd. bowl is raised and lowered by two double-acting cylinders. It is tipped back and forth by a 6-in. double-acting hydraulic cylinder to pry out and lift boulders, uproot stumps, or change the digging angle of the blade from cutting or float position. Inclusion of a power-shift transmission as standard equipment eliminates the engine clutch and permits the operator to shift instantly from forward to reverse even while moving. A locking differential in the front axle automatically applies power to the wheel with the firmest footing.

The tractor shovel was designed for in-plant handling of bulk materials. Stress has been placed on dust protection features. The machine will handle 1500 lbs. while traveling at 5.6 mph. Full information on either machine can be obtained from Clark Equipment Co., Benton Harbor, Mich. (ITS NEW)

C. Lee Cook Appointments

Richard W. Hoyt

Joseph C. Lepic

Two appointments have been announced by Philip W. Mettling, President, C. Lee Cook Co. Louisville, Ky. Mr. Mettling named Richard W. Hoyt as Assistant to the President and Joseph C. Lepic as sales engineer in the Wisconsin-Michigan-Chicago territory. The Cook Co. manufactures a line of industrial piston rings, metallic packings and valve plates.

Prior to joining Cook, Mr. Hoyt was vice president and chief engineer of the Double Seal Piston Ring Co., and previously was with Bendix Aviation Corp. He graduated from Purdue in 1935 with a degree in Mechanical Engineering, is active in the Society of Automotive Engineers, and has written many technical papers for magazines. Mr. Lepic formerly conducted research on diesel and gas engines for the Armour Research Foundation and was a field engineer for the Cooktite Ring Sales Co.

Named General Sales Manager

P. E. Tobin

W. R. Patterson

P. E. Tobin has been appointed general sales manager of the Truck Division of The White Motor Company, with headquarters in Cleveland, it was announced by J. N. Bauman, vice-president. Mr. Tobin has been north Atlantic regional manager for White in New York City. The new general sales manager has been with White Motor in sales posts for the past 14 years. Since 1942, he has been in charge of the North Atlantic Region, with headquarters in New York. William R. Patterson, formerly a sales representative at the Pittsburgh branch of The White Motor Company, has been named assistant to P. E. Tobin. He has been transferred to the Cleveland home office staff and is assigned to handle product and policy matters in the general sales department. He succeeds J. D. Courtright, who has taken over the White and Autocar distributor operations at Providence.

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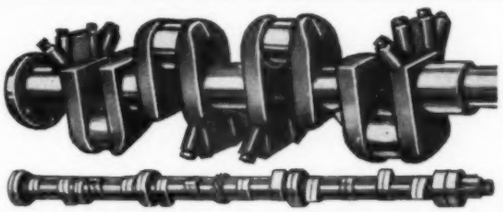

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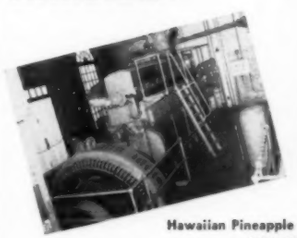

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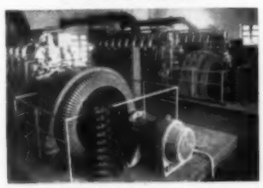

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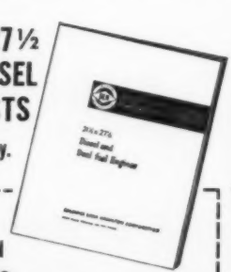

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